Gas Journal

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Editorial Notes

A Peace-Wartime Budget

A LENGTHY period of suspense in the City and elsewhere was ended on Tuesday of last week, when the Chancellor of the Exchequer produced his rabbit from the hat. As has happened on previous occasions, the pundits proved, in all but one respect, singularly at fault in their suggestions regarding the precise colours which the " rabbit " would assume. Some increase in the already colossal rate of income-tax had been generally anticipated, and this is the respect in which the prophets turned out to be correct. From 4s. 9d. to 5s. in the pound, which is the new rate, may not in itself be a very big jump, and there is obvious truth in the argument put forward that " one-quarter of each pound " to be handed over to the State involves an easier calculation than the first-named figure. But it has to be remembered that the tax already stood at a rate which enormously restricted the spending powers of the payers. It is only too greatly to be feared that much water will have to pass under the bridge before the " simple sum " now arrived at will be varied in favour of John Citizen.

Lipstick, which had been singled-out in advance (along with patent pills, and other household gods) as a likely subject for the Chancellor's attentions, and which, by the way, may be looked upon as a sign of the times, has escaped, and, at the same time, the male servant licence duty, which had become an anachronism, is abolished. Other small variations are proposed, one being designed to prevent the sale of securities before dividend and repurchase at a lower price after the dividend has been paid, and another to rope-in more effectively the " one man " style of company.

But these are, after all, comparatively speaking trifles, and Mr. Neville Chamberlain was on the look out for millions of additional revenue. To be precise, for the year 1937-38 he needs £15,000,000 more, and of this he expects to get £13,000,000 from the additional 3d. on income-tax. The remaining £2,000,000 this year (and, it is calculated, from £20,000,000 to £25,000,000 in the following year) it is planned—and here was the surprise of the Budget—to secure from the revival of a form of Excess Profits Duty, Prosperity Tax, or, to give it its strict and formal title, a National Defence Contribution. To some people this has been a very unpleasant surprise; but though the computation of the " contribution " appears to be complicated, it may be possible to work it in along with the ordinary income-tax returns, in which case there should be no need for the influx of a large number of new officials for the collection of the impost—a point of some importance at this juncture.

The principles of the new tax have been too fully discussed in the national daily and financial Press to require amplification here. We cannot believe that Mr. Chamberlain contemplates any measure so injurious to trade and industry as would appear from the comments of those who have made a dead set against it. From his reference to it as a " special and temporary " contribution we must derive such consolation as we can, awaiting in the meantime the full detail which will evolve in the Finance Act after consultation and debate of which the Chancellor is unable, for State reasons, to avail himself prior to the Budget statement.

Evidently the Chancellor does not anticipate any adverse effect upon trade from the new tax, for he has staked everything upon continued substantial expansion of revenue. For 1937-38 he has to find the stupendous sum of £863,000,000, while the revenue, on the existing basis, is estimated at £848,000,000—which, as already mentioned, leaves him with a further £15,000,000 to find. In fact, the deficiency now is practically identical with the sum which Mr. Chamberlain had to raise by additional taxation a year ago. The position is, of course, one which has got to be faced, and there will be no " funking " of the issue by the taxpayer. But from the point of view of that long-suffering individual it is an extremely serious state of affairs, and, listening-in to Mr. Chamberlain's broadcast, after he had presented his Budget to the House, one could not help feeling that he himself realized this to the full. As the origin of these new inroads on our pockets, the staggering re-armament programme has been, as a matter of course, soundly rated, but is not

much of the blame for to-day's position rightly to be sought a good deal farther back than this? It is, however, of no use now to speculate upon what is past; the problem at present, as it affects us all, is of child-like simplicity: We have got to fight with all our might, and with every means in our power, for that continued substantial expansion of revenue, without which the position will be parlous indeed.

Oil from Coal

In the House of Commons last week the Secretary for Mines was asked whether he could make a statement regarding the intentions of the Government in relation to the development of oil from coal. Captain Crookshank replied that the Government has given much attention for a long time past to the possibility of assisting the development of oil from coal processes, and he referred to the tangible help of the preference under the British Hydrocarbon Oils Production Act. The Government, he continued, realized that the possibility of obtaining substantial supplies of oil from coal had excited much public interest, and it had therefore decided to seek the advice of a committee, which would be constituted as a sub-committee of the Committee of Imperial Defence. This committee would be asked to consider and examine the various processes for the production of oil from coal and other indigenous materials and to report on their economic possibilities and on the advantages to be obtained by way of security of oil supplies in emergency. Mr. Hall enquired when the names of the committee could be given and expressed the hope that the Minister for Mines would keep in mind the advisability of appointing persons in no way financially interested in the production of oil and its distribution. Captain Crookshank replied that the committee would be a small one and that these points would be borne in mind. Mr. Shinwell queried the wisdom of setting up a sub-committee which has to report to the Committee of Imperial Defence. Would the latter Committee, he asked, then have to report to the Government? Would it not have been more appropriate to set up an independent committee which could have reported to the Government direct? The natural interpretation, he argued, of setting up a sub-committee of the Committee of National Defence would be that the question was regarded only as one associated with war preparation and defence, whereas the subject had other aspects equally important. However, Captain Crookshank gave the assurance that these aspects are well in mind and were covered by the terms of reference. We hope that the names of those appointed to the sub-committee will be announced and the results of their deliberations made known.

Domestic Coke

An investigation of more than ordinary interest was described by Dr. W. Davidson, of Radiation Limited, in a Paper at the last meeting of the Western District of the Scottish Junior Gas Association; and as a result of this investigation the Author arrives at definite conclusions which should be carefully noted. The object of the work was to produce by high temperature carbonization a coke in all respects suitable for burning in domestic appliances—the open grate and the hot water boiler. Dr. Davidson admits that the low temperature carbonization industry has made progress, but questions whether it will ever make more than a small contribution to the problem of supplying the domestic market with smokeless fuel. This is not because the fuel produced is unsuitable but because the methods of manufacture are costly and a comparatively high price must be obtained for the fuel. The work he describes started with an investigation of all the cokes made in ovens in Scotland; and it was found that, suitably screened, several of these cokes were excellent fuels for slow combustion stoves and domestic boilers. Even the most combustible of them, however, was quite unsuitable for burning in an open grate. These cokes were made from crushed coal, and apart from the difficulty of kindling, the finely divided ash presented a very real problem. It adheres to the coke, spoiling the appearance of the fire and lowering the radiant efficiency, and it finds its way into the room when the fire is raked.

The detrimental effect of a finely divided ash on the performance of a coke in the open grate was so pronounced that it was considered that uncrushed coal should be used for the manufacture of domestic coke; and a series of tests was made to determine the effect of varying the size of the coal and the carbonizing period and temperature on the combustibility of the resultant coke. The results of these tests are set out in detail by Dr. Davidson. As was to be expected, the shatter indices of the cokes made from nut coals are lower than those obtained from the coke made from the corresponding crushed coal, but the cokes are strong enough to withstand much breakage if used for domestic purposes. The best domestic fuel was made from treble nuts. It was easy to kindle and recovered very quickly after replenishing. The structures of the cokes obtained from the uncrushed coal nuts was quite different from that made from crushed coal. Throughout each piece of coke there were pockets of coke of large pores; and the Author puts forward the view that these pockets determine the ease of kindling of the coke. The coke consists of very dense coke with pockets of porous coke, and the dense coke is unreactive to carbon dioxide. This fact contributes to its high radiant efficiency. As for the ash, this is dense and low in quantity, and it falls from the surface as the coke burns. Again, the ash does not hinder the supply of air to the burning coke to as great an extent as the fine ash of cokes made from crushed coal.

The investigation was carried out both in experimental ovens and on a full-scale 14 in. silica oven. In each case the results were conclusive—that cokes made from nut coal are " much more combustible and efficient and are in every way superior open grate fuels to those made under the same carbonizing conditions from the same coals when crushed. . . . The optimum conditions for the preparation of a domestic coke in ovens would appear to be to carbonize treble nuts of a coking coal in 14 in. ovens using flue temperatures of 1,000° C. and a carbonizing period of 16 hours." The special domestic oven coke was compared with low temperature cokes at present being made in Great Britain; and from the results " it is apparent that the special domestic oven coke compares very favourably with any of the open grate fuels at present being marketed." Nor was the investigation confined to the use of coke in the open firegrate. A comparison was made of the performance of coal nuts, low temperature cokes, anthracites, graded furnace coke, and the special domestic oven cokes in the domestic hot water boiler. It was shown that the cokes made from treble nuts give efficiencies 15% higher than that from the best quality of Welsh or Scottish anthracite. Moreover, in an appliance having a capacity of only 10 lb. of coke, " the flexibility of the special domestic oven cokes is so great that no difficulty in maintaining the fire overnight would

be experienced." The results given by Dr. Davidson are exceedingly interesting and once again emphasize that raw coal can be replaced by smokeless fuel prepared in the light of a full knowledge of the requirements of the domestic market. They emphasize, too, the flexibility of the carbonizing process and show how necessary it is that the Gas Industry, by co-operation, should consolidate the coke position.

Courses in Gas Fitting

REFERENCE has already been made in the " JOURNAL " to the Short Course for teachers of Gas Fitting which is to be held by the Board of Education from July 5-10 in Birmingham. This Course, of obvious importance in view of the increasing part which efficient and intelligent fitting work plays in ensuring that the consumer derives the best benefit from gaseous fuel service, is to be conducted by Dr. P. C. L. Thorne, one of His Majesty's Inspectors, who is closely concerned with the success of the Education Scheme of The Institution of Gas Engineers and who devotes much time to non-spectacular, nevertheless valuable, committee work on the Gas Industry's behalf. Teaching demands, perhaps above all, patience. But a teacher can never " stay put." It is necessary that he should be thoroughly knowledgeable of current events and new developments; and this applies not merely to the developments of the particular craft the technique of which it is his job to impart, but also to the technique of teaching itself. For which reason we are glad to note that such stress is laid on teaching methods, as distinct from the actual information which has to be set out clearly, and, unfortunately, with some dogmatism, to fix itself in the student's mind.

It is good that teachers should, as part of their curriculum, be at regular intervals " in class." After all, if a teacher once gets set ideas about the subject or subjects on which he imagines he has some facts, the student, irrespective of the certificates he may gain by praiseworthy, occasionally unguided, effort, will be behind the times. We believe that the Gas Industry, in its plans for education and training—education first—is setting an example to many other industries and institutions in this country, and that it will reap the full benefits of its policy in a brighter and more self-conscious personnel. It will take some time for this plan properly to fructify, but the determination behind it all will, quite definitely, not be in vain; and the plan will progress the swifter in the realization that teachers may themselves be taught. Not only is it a matter of teaching; there is the " getting-together " aspect. The course at Birmingham, with the facilities provided by Saltley College, is a means of social intercourse for the exponents of gas theory and practice which cannot do otherwise than clarify issues while broadening outlook.

The Board of Education Course—only one of its many courses in gas technology—at Birmingham is not the only one which lies open to teachers of Gas Fitting. We learn with the liveliest satisfaction that, with the approval and support of the Gas Light and Coke Company, the London County Council has arranged for a " Summer School " for Gas Fitting teachers. At their disposal is Watson House, and it does not, to-day, require from us emphasis of what this implies. The aim of the course—as is the object of similar endeavours—is to give all teachers concerned with Gas Fitting and ancillary subjects an opportunity of keeping abreast of modern developments in the Gas Industry and of showing the best methods of technical instruction. Lectures are to be given by experts in the Gas Industry and in technical education, and valuable works visits and demonstrations have been arranged. The Director of this L.C.C. Course is Mr. J. H. Currie, who is Inspector of Technical Education to the Council, and the Assistant Director is Mr. R. N. LeFevre, of the Gas Light and Coke Company. The Course is from Monday, June 7, to Friday, June 11, and it will be opened by an Address by Mr. Stephen Lacey. Let it be said at once that this Course of the London County Council is in no way in competition with the Course in Gas Fitting of the Board of Education. It is complementary and, as such, much to be welcomed; and we have little doubt that it will be adequately supported. On account of its venue, the Board of Education's Course will, perhaps, the more attract those in the Midlands and the North. The L.C.C. Course at Watson House will, again on account of its situation, cater for London and the South. The arrangements made for the comfort of those taking part—and at a minimum of cost—in both courses are admirable. Both constitute a common meeting ground to teach teachers the folly of the rut. These courses, however, go further than that—or should do. Given the right spirit among teachers in the Gas Industry, and in fact we think that this spirit does exist, they serve to stimulate and encourage a class of the Industry's personnel which, for full success, should keep an open mind and show a willingness to fraternize and learn. In our news pages to-day will be found a list of the lectures to be given in the L.C.C. Course at Watson House—a list which speaks for itself.

Testing Materials

THE need in this country of some means to provide for more adequate co-ordination of the study of materials and their testing has, during the past year, received the earnest consideration of the principal technical Institutions and Societies who are concerned directly and indirectly with these important subjects. From the outset, the undesirability of creating yet another independent organization was fully recognized and accepted, and attention has been devoted to the formation of a co-operative organization set up within the existing framework of interested Institutions and Societies. The proposal was fully discussed at special conferences of nominated representatives of the Councils of technical Institutions, among them being The Institution of Gas Engineers, the Institute of Fuel, and the Chemical Engineering Group of the Society of Chemical Industry. It was agreed that closer collaboration in this matter was desirable, and a detailed scheme was evolved which has now resulted in the formation of a Joint Committee on Materials and their Testing consisting of one nominated representative of each co-operating Institution and Society.

Materials are inseparably associated with engineering and industrial developments of all kinds, and there are few of the major technical Institutions in this country whose activities do not include some attention to materials and testing. With the majority, however, this attention is necessarily limited in view of the much wider field of technical and professional interests of their members. Hence the need for some common co-operative platform now provided by the new Joint Committee upon which are represented no fewer than twenty-two Institutions and Societies.

This new body will not absorb or replace in any way

the activities of any existing technical organization; its essential object is to supplement with regard to materials and their testing the present activities of the co-operating organization. The Joint Committee is to act as the British National Organization and the objects are to promote joint discussions on the wider aspects of materials and their testing; to assist a co-operating Institution or Society in the presentation of a Paper or group of Papers dealing with more detailed aspects of the subjects; and to undertake duties in respect of international matters. The work of the Joint Committee will divide into two fields of activity—national and international, of which the former will no doubt be of major importance. The activities of the International Association for Testing Materials in this country were entrusted to the keeping of a British Committee, and the latter agreed that, at the conclusion last week of the London Congress of the International Association for Testing Materials, the Joint Committee should take over the representation in this country of all matters connected with the International Association. We agree with the view put forward by the co-operating Institutions that the work of the Joint Committee will be of value, not only from the scientific and technical standpoint, but also from that of industry. It is to be hoped that this work will receive recognition, interest, and general support.

Personal

The New B.C.G.A. Secretary.

At a meeting on Wednesday of last week of the General Committee of the B.C.G.A., Mr. P. J. Lucas, who had been Acting Secretary of the Association since the death in November last of Mr. J. C. Walker, was appointed Secretary.

Mr. P. J. LUCAS

Mr. Lucas joined the staff of the Gas Light and Coke Company in the year before the war, and after a period in their district offices was attached to the personal staff of the Controller of Gas Sales, then Mr. F. W. (now Sir Francis) Goodenough. After four years' war service he rejoined the Gas Light and Cok Company, but in 1919 went to the B.C.G.A. as an assistant to Mr. J. C. Walker, the Secretary. Subsequently Mr. Lucas was appointed Administration and Finance Officer. Mr. Lucas has been in charge of the education and training scheme for gas salesmen since its inauguration some five years ago, and is also Secretary of the Staff Pension Scheme.

When Mr. Lucas joined the B.C.G.A. in 1919 the Association had a staff of half-a-dozen; to-day the staff numbers over sixty. There are only three other members of the B.C.G.A. staff with a similar length of service to the new Secretary.

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On April 9, Mr. A. E. Brooks, Clerk at the Gas-Works, retired after 42 years' service with the Cambridge University and Town Gas Light Company. In presenting Mr. Brooks with a whisky decanter and glasses, two pipes, and a tobacco pouch, which were subscribed for by his fellow workers, Mr. J. Hunter Rioch, Engineer and Manager, mentioned that during Mr. Brooks' service the consumption of gas had increased from 200 million cu.ft. to nearly 1,000 million cu.ft.; and he had served under five managers. He regretted losing the help of one who had had a long experience with the Company, and expressed the hope that Mr. Brooks would have many long and happy years to enjoy his well-earned retirement.

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Mr. William Balfour, formerly Gas Manager at Bridge of Allan, now merged with the Stirling Gas Light Company, has been appointed to a similar position at Kirkcudbright.

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Miss Sheila Stubbs, daughter of Mr. J. Sandon Stubbs, Secretary and Treasurer of the Liverpool Gas Company, was married last week to Mr. Ronald Davies.

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Councillor S. Croston was elected Chairman of Adlington Council on April 22.

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On the completion of fifty years' service with the Motherwell and Wishaw Gas Department, Mr. John Reid, Chief Clerk, was the recipient of a barometer and an easy chair from the Staff and employees of the Department.

The presentation was made by Mr. Alexander McDonald, B.Sc., Engineer and Manager, who referred to Mr. Reid's modesty, observing that he fulfilled the rôle indicated by Mencius when he said: "He whose goodness is part of himself is a real man." Mr. Reid had served under no less than five Chiefs, being the confidant of every one of them in their trials and troubles. Mr. Reid, in thanking the Staff and employees, recalled some of his early days at Motherwell.

Forthcoming Engagements

May.

4.—S.B.G.I.—Council Meeting at 56, Victoria Street, 11.45 a.m. [*Transferred from May 5.*]

5.—S.B.G.I.—Annual General Meeting and Dinner, May Fair Hotel.

5.—Manchester and District Juniors.—Visit to R. & J. Dempster, Ltd., Newton Heath, Manchester. Paper by A. E. Hardman (Widnes), "Steaming in Horizontal Retorts."

6.—N.G.C.—19th Annual Meeting, Grosvenor House, W. 1, 2.30 p.m.

6.—Midland Juniors.—Annual General Meeting.

7.—London and Southern Juniors.—Annual Business Meeting at the London School of Hygiene and Tropical Medicine, Keppel Street, W. 1.

7.—North of England Association.—Paper by J. E. Dixon (Newcastle-upon-Tyne), "Fuel Problems on Gas-Works."

7.—Wales and Monmouth Juniors.—Annual General Meeting at Cardiff.

15.—Scottish (Eastern) Juniors.—Annual General Meeting at Dunfermline.

22.—Yorkshire Juniors.—Meeting at Halifax; short Papers by Mr. C. Daughtery (Leeds) and Mr. J. Castle (Brighouse).

27.—Wales and Monmouthshire Association.—Annual Meeting at Cardiff.

July.

2.—I.G.E.—Joint Committee on Complete Gasification under Pressure, Department of Scientific and Industrial Research, 16, Old Queen Street, S.W. 1, 3 p.m.

CORRESPONDENCE

Home Oil Production

SIR,—Through your editorials I am keeping in touch with the general situation in the carbonizing industries in Great Britain. The many years I spent there will always keep my interest alive regarding new developments, notwithstanding the fact that "high finance" forced me out of business, and often even now I wonder why low-temperature carbonization was in the past so consistently singled out for the specific attention of such "financiers," but, as Kipling said, this is another story.

It has, however, been my good fortune to be able to follow developments, and I am gradually coming round to the belief that with the advent of modern gas-works practice, blending of coals, proper attention to grading of coke, and new designs of coke burning grates, the unique properties once believed to be held solely by low-temperature solid fuels are now gradually passing over to high-temperature gas-works coke.

Low-temperature carbonizing still gives better tar and more of it from the point of view of hydrogenation into petrols and lighter oils, but, as you rightly say, it is more than problematic whether the country's petrol requirements can be met that way, and you draw attention to the gas side, and here I am with you. However, the trouble with a more general application of gas as a vehicle fuel is not only the relatively low calorific value of the ordinary town gas, necessitating bulky and heavy containers for any reasonable energy storage; there is also the loss in efficiency of the engine when running on gas as compared with petrol, and this is perhaps the more serious of the two. If, however, we take low-temperature gas, the picture is somewhat different. Let us for the sake of argument take a high volatile non-coking or slightly coking coal, run-of-mine stuff for preference, and let us see what can be done. I must here say that I consider it nothing short of a crime to use good coking coals for low-temperature carbonization; the coke ovens, gas-works, and allied industries have the first call on these coals, and it would be squandering the wealth of the country otherwise.

By ordinary low-temperature treatment of suitable coals we obtain anything from 3,000 to 3,500 cu.ft. of high calorific gas per ton of coal, the gas having a calorific value of about 800 B.Th.U. per cu.ft. The Fuel Research Board has consistently found even higher calorific values—in other words, heating values twice that of town gas. If this heat energy is converted into terms of gallons of petrol, it will correspond to the equivalent of between 15 and 16 gallons. The yield of low-temperature tar per ton of coal can be assessed at 18 to 20 gallons, and in this tar we find about 2 to 2½ gallons of first-rate motor spirit by stripping. If we hydrogenate the balance of the tar, we can reckon on another 15 to 16 gallons of petrol, making a total of petrol and proper petrol substitute of 32 to 34 gallons per ton of these coals. This would appear to me to be something worth going for.

As said before, low-temperature gas has twice the heat value of town gas. Therefore, in its compressed state, we can carry for the same weight of container double the heat energy. Furthermore, the low-temperature gas is much richer in the heavier, high calorific value, hydrocarbon gases; consequently the loss in efficiency in the engine as compared with the running on petrol should not exist.

I specially drew attention to the utilization of the non-caking or rather non-coking variety of high volatile coals. When operating on run-of-mine material the coke will come out of the retort in much the same form as the coal going in. I would grade the fuel obtained very carefully, remove slate and smalls below, say, ¾ in. mesh, dry clean it for dust, and obtain an ideal fuel for portable gas producers for heavy road transport work. I would possibly consider the combination of compressed low-temperature gas in containers and gas producers operating on the semi-coke for the same heavy transport vehicle. I would use the compressed gas for starting up, and then switch over to the gas producer, eventually adding some of the compressed gas to the lean producer gas, so as to bring up the engine efficiency.

The small fuel, breeze, &c., I would burn on a chain grate stoker under a boiler. In other words, I would delegate the low-temperature plant to its proper place—namely, that of an adjunct to a power plant or a gas-works, an important adjunct, but always secondary. In this way, I believe, coals of this particular type could be utilized to the best advantage without encroaching on the domain of other coals, and would be split up into fractions of greatest possible availability.

With regard to the type of plant, I would propose, I think, that I would follow the lines, or very similar ones, of the large rotary retorts, as it would here be a question of treating material in the greatest possible bulk economically; but there would be certain radical alteration from the rotary type I invented and erected at Ashby-de-la-Zouch. Instead of 100-150 tons throughput of coal per diem, I would go to nearer 200-250 tons per single unit, and I would not use solely internal heat, as I did in those days. The principle of the large rotaries of that type has stood the test of time, but certain developments in design have taken place, and new materials are now to hand which would permit different designs, tending to greater efficiency and throughputs, and full advantage can be taken thereof.

New designs along these lines are now ready, and I shall be happy to place these at the disposal of seriously interested parties in Great Britain.

Yours, &c.,
HARALD NIELSEN.

Danish Gas Technical Laboratory,
Copenhagen, F.
April 20, 1937.

Salesmen's Day

Annual Meeting of Circles in London

A large number of members of the B.C.G.A. Gas Salesmen's Circles, representative of more than eighty gas undertakings from all parts of the country, gathered at Caxton Hall, Westminster, S.W., on April 16 for their Annual Meeting. The event was honoured by the presence of Councillor W. P. Jackson (President of the B.C.G.A. and Chairman of the Manchester Gas Committee), who presided, being supported by Mr. A. W. Smith (Birmingham), the Chairman of the Executive Committee of the Association, and Mr. W. D. Rowe (Manager).

In the course of the business of the meeting the "Good-enough" Gold Medal and Area Silver Medals for salesmanship papers read during the past session were awarded, together with the medals in connection with the B.C.G.A. Public Speaking Competition, the final of which took place the previous evening.

A stimulating Address entitled "The Triangles of Business" was given by Mr. H. Ernest Hunt, and after lunch the members paid their usual visit to the Ideal Home Exhibition at Olympia. A full report of the meeting will be published in the May issue of the "GAS SALESMAN."

Gas Exhibition at Hyde

Successful Results of Co-Operative Effort

Nearly 2,500 people attended a recent week's exhibition of gas appliances organized by the Hyde Gas Company in the local Public Hall, which is stated to be a record total for this area. In addition, 77 appliances were sold as a result of the effort, in which the following manufacturers co-operated: R. & A. Main, Ltd., Stoves Ltd., General Gas Appliances, Ltd., Richmond Gas Stove Company, Ltd. (Radiation Ltd.), Ascot Gas Water Heaters, Ltd., and W. H. Dean & Son.

Interesting features of the exhibition included a display of talkie films, cookery lectures by Miss Gompertz (of R. & A. Main), washing demonstrations by Miss Stott (of W. H. Dean & Son), a café for teas, served by Lyons, together with musical interludes to complete an attractive programme.

Mr. J. Brabbs (Engineer and General Manager of the Hyde Gas Company) was responsible for the arrangements, while the publicity department of the United Kingdom Gas Corporation, who control the Undertaking, gave every assistance in the organization of the event.

News in Brief

CURRENT EVENTS IN THE GAS INDUSTRY

A Reduction in the price of gas for bakers' ovens to 3s. per 1,000 cu.ft. has been made by the Llandudno Gas Committee.

A Striking Spectacle will be presented during the Coronation celebrations by the offices of the Accrington District Gas Board. Flares are being installed on the roof, and the exterior will be floodlighted.

Owing to the Recent Amalgamation with Brighouse, the Hipperholme U.D.C. Gas Undertaking is now under the control of Mr. John Corrigan, Engineer and Manager of the Brighouse Corporation Gas Department.

The Gas and Electricity Committees of the Marple Council are not to be administered by separate committees and under separate managements. A resolution for the abolition of dual control was rejected on the ground of economy and efficiency.

The Calorific Value of gas supplied by the Stroud Gas Light and Coke Company in the Rural District of Tetbury (recently taken over from the Tetbury Gas Company together with the areas of the Brimscombe and Chalford Company) will be 500 B.Th.U. per cu.ft. as from July 24.

Applications are Invited by the Thornton Cleveleys Urban District Council for the position of Gas Manager at a commencing salary of £350 rising by four annual increments of £25 to a maximum of £450 per annum. Further particulars will be found in this week's advertisement columns.

The Society of British Gas Industries draw our attention to the fact that the Council Meeting originally called for the morning of May 5 will now be held at 56, Victoria Street, S.W. 1, at 11.45 a.m. on Tuesday, May 4. The Annual General Meeting and Dinner will as previously announced take place on May 5.

We Are Indebted to Mr. Punch for an advance copy of his Coronation Number, which is fully worthy of a great occasion and of his own honourable traditions. Produced for the first time in the history of *Punch* wholly in colour, it runs to no fewer than 64 pages, and from the first to the last an exceptionally high standard of humour and craftsmanship is sustained.

A Probable Increase in the price of gas due to the increased cost of coal was intimated at a meeting of Forfar Town Council on April 21 when the Engineer and Manager of the Gas Department, Mr. H. B. Skea, reported that he had made contracts for 7,600 tons of coal at an average price of 27s. 3d., which was 2s. 2d. higher than last year. Coalowners were refusing orders as far ahead as September.

Application to the Board of Trade is intended to be made by the Shotley Bridge and Consett District Gas Company under the provisions of Section 1 of the Gas Regulation Act, 1920, for an Amending Order for the modification of the statutory or other provisions affecting the charges which may be made by the Company by substituting for the present maximum price of 16d. per therm a new maximum price of 14d. per therm.

A Successful Exhibition has just been concluded in the Co-operative Hall, Cambridge. The exhibition, to which we referred in an earlier issue, was organized by the Cambridge University and Town Gas Light Company. A feature was the presentation of "Regulo" cooking timers to all purchasers of "New World" cookers. The attendances and business accruing have been very satisfactory and the cake-baking competition prizes, which took the form of vouchers permitting prize winners to purchase goods in the district, were presented by Mrs. J. Hunter Rioch, wife of the Engineer and Manager of the Company, who was also present.

Amalgamation and Grouping

Severn Valley, Monmouth, and Leominster.

The Severn Valley Gas Corporation, Ltd., announce that their offers to the shareholders of the Monmouth Gas and Water Company, Ltd., and the Leominster Gas and Coke Company, Ltd., have been accepted by the holders of a substantial majority of the shares of both these Companies.

Society of British Gas Industries

Sir Harold Hartley to be the New President

The Society of British Gas Industries announce that they are in the happy position of having secured Sir Harold Hartley's acceptance of the Presidency of the Society for the coming year.

Sir Harold Hartley, C.B.E., M.C., M.A. (Oxon.), Hon. D.Sc. (Sheffield University), F.R.S., was born in 1878, and educated Dulwich College, Balliol College, Oxford, and the University of Munich. He was Tutorial Fellow of Balliol College, Oxford, the Duke of Bedford's Lecturer in Physical Chemistry 1901-1931, and Jowett Fellow from 1928 to 1931, being Senior Research Fellow of Balliol since 1931.

Since 1930 Sir Harold has been Vice-President and Director of Research of the L.M.S. Railway, and Chairman of the Fuel Research Board of the Department of Scientific and Industrial Research since 1933. He is also Chairman of the British National Committee and of International Executive Council of the World Power Conference, and was President of the British Cast Iron Research Association (1930-1933); President of Section B of the British Association (1931) and of the Association of Technical Institutions (1935); a Member of the Key Industry Duties Committee (1935). He is the Author of papers on scientific and industrial research and on transportation problems, including the James Forrest Lecture (1933), "Recent Advances in the Application of Chemistry to Engineering;" Hinchley Memorial Lecture (1935), "Our National Coal Resources;" "The Transport of Food by Rail;" and "Scientific Research on the L.M.S."

Women's Gas Council

Monthly Meeting of the Demonstrators' Circle

"Diet" was the subject of an interesting talk given to the London and Home Counties Demonstrators' Circle on Monday, April 19, when Miss F. Owen, B.Sc., recommended to the members a knowledge of dietics as being an invaluable aid to public health. Many of the minor symptoms of poor health, such as the common cold, were due to ignorance of the correct balance of food, since the amount of food eaten each day should contain certain minimum amounts of protein, starch or sugar, and fats; in every class of society people failed, or were unable, to

observe this balance. Miss Owen gave as an example a typical middle-class menu containing far too much protein content, and followed with the various body-building and energy-creating foods which are necessary every day to ensure perfect health, and create the foundations of a good menu.

Miss Owen then dealt with the popular subject of slimming. The principle of slimming diets, she stated, was not to eat less food, but to avoid the energy-creating foods, so that the body had to have recourse to its own fat to make energy. Much harm could be done by wrong methods of slimming, and she thought that diet could usefully be introduced in the course of demonstrations as a real service to the community.

Summer School for Gas Fitting Teachers

L.C.C. Course at Watson House

By arrangement with the Gas Light and Coke Company the London County Council has planned a Summer School for Gas Fitting Teachers, to be held from June 7 to 11 at Watson House. The Director of the Course is Mr. J. H. Currie, Inspector of Technical Education to the London County Council, and the Assistant Director is Mr. R. N. LeFevre, Officer-in-Charge of Training to the Gas Light and Coke Company. Mr. Stephen Lacey, President of The Institution of Gas Engineers, will open the Course.

The lectures to be given are by Mr. Currie, who will discuss the Principles of Teaching; Mr. S. F. Dunkley, O.B.E., who will deal with Standardization; Mr. L. Friedman, on Water Heater Design and Manufacture; Mr. LeFevre, on Public Relations and Water Heater Installation; Dr. J. N. Long, Principal, L.C.C. Westminster Technical Institute, on the Organization of Gas Fitting Courses; Dr. W. A. Naish, of the Chelsea Polytechnic (Metallurgical Department), on Metallurgy and its Application to the Gas Industry; and Mr. W. S. Watts, of Bratt Colbran & Co., Ltd., on the Decorative Treatment of Gas Fires.

The Design of Industrial Lighting Fittings

Illuminating Engineers' Discussion

A highly satisfactory feature of the past session so far as the Illuminating Engineering Society is concerned has been the promising measure of success attending the first year's operation of the special sections. It will be recalled that in our report of the Annual Meeting of the Society held in May last year, these special sections, dealing with such aspects of the lighting problem as photometry, architecture, decoration, and industrial requirements, were formed as part of a scheme for the improvement of the Society. It had then been felt for some time that the number of full meetings of the Society held each year did not permit of sufficient time for a full and satisfactory discussion of these important subjects. The scheme has exceeded even the most sanguine expectations of its promoters.

On the occasion of the last meeting of the present session of the Industrial Lighting Section, held at the Lighting Service Bureau, 2, Savoy Hill, W.C., Mr. W. R. Stevens, B.Sc., opened a discussion on the design of industrial lighting fittings in relation to their performance. There were seven factors to be considered in the design of industrial lighting installations, Mr. Stevens observed, and these were: Amount of light, glare, shadows, maintenance, appearance, nature of the light employed, and cost. Regarding the first of these factors, they were all aware of the Table of Illuminating Values which had been issued by the Society. It was an interesting fact that from year to year lighting values were increasing, owing very probably to the fact that as people became more "light-conscious" they demanded a higher order of illumination.

Glare, of course, had to be kept as low as possible. In this respect one had also to reckon with reflected glare that might arise from polished surfaces and machinery. On the question of the nature of the light employed, Mr. Stevens was of the opinion that monochromatic was the best for fine work, but for other work one had to consider light output. An interesting fact emerged from one of the demonstrations, and that was the fact that with sodium discharge lighting there is no colour discrimination. He thought a spacing-height ratio of 2 or 1½:1 gave a fairly shadow-free lighting. On a special apparatus which gave a speedy register of the polar curves of various sources, Mr. Stevens demonstrated the effect of building up, by degrees, the standard industrial lighting fitting as we know it to-day. Other interesting demonstrations included the effects of various materials when used for reflectors; their behaviour in actual use was then shown by the speaker.

Among those who contributed to the discussion was Mr. A. R. McGibbon, of Messrs. William Sugg & Co., Ltd. Another contributor, in support of Mr. Stevens' contention that illumination values were on the up-grade, referred to some war-time literature on the subject of industrial lighting he had recently to hand in which it was stated the requirements for type-setting were satisfied by one foot-candle, whereas the present-day value suggested in the Society's Table was 25 to 50 foot candles.

Bromley Gas Centenary

Local Manager's Talk to Rotarians

The fact that gas was first used in Bromley a hundred years ago this year was mentioned by Mr. D. W. Evans, Bromley District Manager of the South Suburban Gas Company, in a "My Job" talk to members of Bromley Rotary Club following their weekly luncheon at the Royal Bell Hotel last week.

The foundation of the Gas Industry in this country, said Mr. Evans, was laid by William Murdoch, who was the first to make practical use of gas by devising means to light his house. Burned at the end of an open pipe, the gas gave a very unsteady flame. Gas taps were unknown, Murdoch's method being to stop the supply with a plug of clay. One day, this plug was missing, so he used his wife's thimble. Unknown to Murdoch, the thimble had a minute hole, and to his surprise a small, steady flame, giving much more light, was produced. This led to the construction of burners.

The discovery of the gas mantle was similarly accidental. About 1885, Welsbach found that when some newly discovered chemicals came into contact with a bunsen flame they set up a brilliant glow. Welsbach proceeded to develop the mantle and introduced incandescent lighting.

When the first public supply companies were formed, at the beginning of last century, they were allowed to operate without restriction, and the result was chaos. In 1853 each company was allotted a definite area by Act of Parliament. To-day there were over ten million consumers and the Industry directly employed over 113,000 workers, in addition to many thousands more employed by manufacturers of materials and apparatus.

The South Suburban Gas Company was incorporated as the Crystal Palace District Gas Company by an Act of 1858. The area then covered was about 14 square miles surrounding Sydenham. The name of the Company was changed in 1904, and since then amalgamation had taken place with several other companies, including the Bromley Company, in 1912, with the result that the present area was 255 square miles, with about 1,200 miles of mains serving 194,785 consumers. The Bromley district, covering about 30 square miles, was controlled from the depôt in the High Street.

Rotarian W. G. Weller, who presided in the absence of the President, thanked Mr. Evans for his talk.

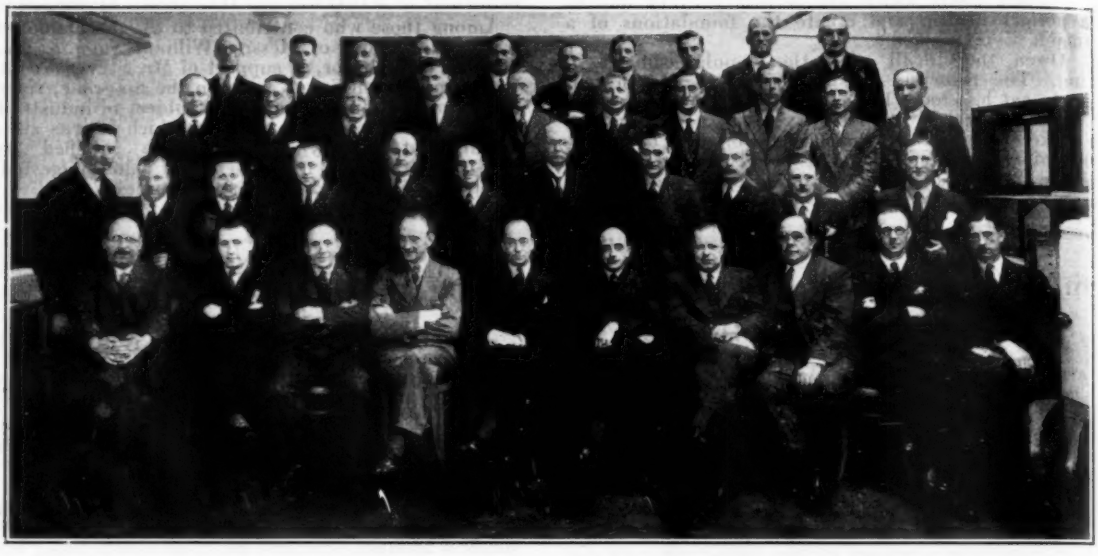
Gas and Electricity Accounts

Two Volumes from America

We are indebted to the State Law Reporting Company, 30, Vesey Street, New York, official reporters and publishers to the National Association of Railroad and Utilities Commissioners in the U.S.A., for two volumes recently issued for gas and electric utilities describing a uniform system of accounts. The system is evidently designed to give a complete picture of the financial position of an undertaking, and to furnish a very detailed record of all income and its expenditure whether on capital or revenue account. The separate accounts to be kept and the items to be included in each of them are fully described and the methods to be pursued in the allocation of charges and expenditure set forth categorically.

The conditions on which a public utility undertaking is operated in the U.S.A. are different from those obtaining in this country, but the principles of accurate accounting are the same, and anyone interested in these as applied to a public utility will be well repaid by a perusal of these two publications. They are published at $2 each.

Gas Executives Guests of Electrolux, Ltd.



Following a similar visit on March 10, a number of gas executives were the guests of Electrolux, Ltd., on April 20. Following a tour of the Works (described in our issue for March 17) the visitors were entertained at lunch at the George Hotel, Luton, where they were welcomed by Mr. J. Scrivener, Managing Director, Electrolux, Ltd., who took the chair. Mr. J. W. McLusky, Engineer and General Manager, Glasgow Gas Department, replied on behalf of the guests, expressing their appreciation of the opportunity afforded them of seeing at first-hand the manufacture of the gas-operated refrigerator. Mr. E. Hardiker, Engineer and Manager, Smethwick Gas Department, also responded.

In the above group, from *left* to *right* in the front row, will be seen: Messrs. G. T. Temblett (Andover), C. H. Chester (Swindon), E. Parry (Oldham), J. W. McLusky, J. Scrivener, E. Hardiker, B. W. Taylor (Birmingham), F. Mitchell (Aylesbury), and G. M. Gracewood (Electrolux, Ltd.).

Western Junior Gas Association

Annual Meeting at Clevedon

A large number of members assembled on April 17 at the Works of their President, Mr. S. B. Jones, of Clevedon. Dividing into two parties, works members inspected the Glover-West continuous vertical retort plant which produces the whole of the gas for Clevedon, while distribution and sales members went to Messrs. Hale's (Clevedon), Ltd., where two large confectioners' conveyor ovens were seen at work. The gas used on this plant is about 10 million cu.ft. annually.

At 4 p.m., members reassembled at the Royal Pier Hotel for the annual meeting, and were welcomed by Colonel S. Keen, D.S.O., R.E., Chairman of the Clevedon Gas Company.

The following officers for 1937-38 Session were approved and elected:

President	Mr. J. E. Ackroyd (Manager, Swindon G.W.R. Gas-Works).	
Senior Vice-President	Mr. A. Tran (Bath).	
Junior ,, .	Mr. A. Bell (Exeter).	
Hon. Treasurer . .	Mr. A. B. Horsfield (Bristol).	
Hon. Secretary . . .	Mr. K. L. Clark (Weston-super-Mare).	
Hon. Auditors . . .	Mr. J. F. Marlow (Weston-super-Mare).	
	Mr. H. W. Randall (Stroud).	
Council	Mr. A. Marsden (Bristol).	Retires 1938.
	Mr. J. T. Davies (Bath).	,, 1938.
	Mr. S. Smith (Bristol).	,, 1939.
	Mr. H. D. Sullivan (Plymouth).	,, 1939.
	Mr. F. W. Sansom (Exeter).	,, 1940.
	Mr. J. W. Denton (Torquay).	,, 1940.

The thanks of the Association to all officers during the past session were heartily accorded during the meeting.

Mr. J. Harger Pye, Managing Director, Clevedon Gas Company, presented prizes given by the Honorary Members for Papers during 1935-36 Session.

1st Prize: Mr. T. W. Clapham, Bristol Gas Company, for a Paper on "Coke Grading Plant."

2nd Prize: Mr. J. W. Denton, Torquay Gas Company, for a Paper on "Distribution."

Mr. J. E. Ackroyd, Senior Vice-President, took the Chair, and called on the President, Mr. S. B. Jones, Assistant Engineer, Clevedon Gas Company, to give his Address, which will be found elsewhere in this issue.

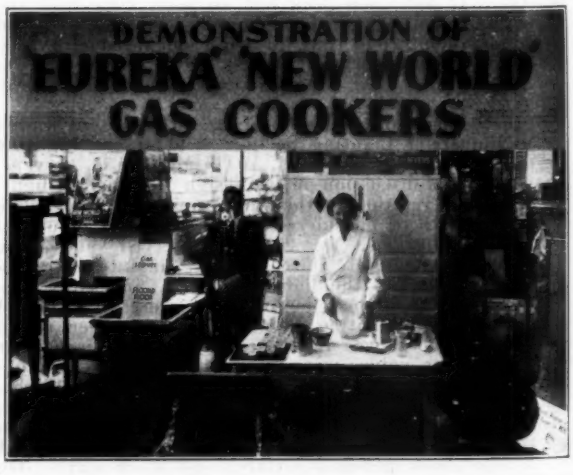
The thanks of the Association to the President for his Address and services to the Association during his year of Office were moved by Mr. ACKROYD, supported by Mr. A. B. HORSFIELD (Bristol), and carried with acclamation.

Tea was served in the Hotel Ballroom following the annual meeting, through the courtesy of the Chairman and Directors of the Gas Company.

The thanks of the Association were expressed by the Senior Vice-President. To this vote Councillor Shopland replied on behalf of the Directors.

Mr. Harger Pye also spoke of the formation of the Association and the good work it had done.

Melbourne Cookery Demonstrations



The above photograph was taken during the course of a very successful series of cookery demonstrations held recently in the window of the Myer Emporium, Bourke Street, Melbourne. We understand that these demonstrations attracted large and interested audiences. It is estimated that more than 12,000 people stayed at the window for periods up to twenty minutes during the four days of the demonstrations, which were continuous from 11 a.m. to 5.30 p.m.

SECOND ANNUAL GENERAL MEETING OF

The Women's Gas Council

Several hundred members, representative of branches all over the country, were present at the Second Annual General Meeting of the Women's Gas Council which, preceded by tea in their new premises, was held at 1, Grosvenor Place, S.W. 1, on Wednesday, April 21 last. The Countess Jellicoe was in the Chair.

Miss MARY WOLSELEY-LEWIS, who had consented to take the Chair for the first part of the meeting, opened the proceedings by saying it was a great honour to have as their Chairman the Countess Jellicoe, one of their Vice-Presidents, who had always taken such a great interest in gas affairs. The great progress that had been made since the foundation, two years ago, of the Women's Gas Council, was almost entirely due to the energy, skill, and vision of Miss Halpin, Organizing Secretary, and they should congratulate all concerned on the fact that not only the number of branches, but the membership in every branch, had increased.

The following appointments were then made:

Returning Officer.—Miss Stampe.
Tellers.—Miss McKenzie and Miss Dawson.

Miss HALPIN then presented the Annual Report for the year 1936-1937, from which the following points of interest are reproduced:

The Second Anniversary of the formation of the Women's Gas Council marks the end of a year of steady growth and development, during which there has been careful building on the foundation already laid. This development has been progressing slowly but surely until the somewhat indefinite ideals of two years ago have been crystallized into a clear-cut form visible to all.

Less time has been spent this year on branch formation and more on the strengthening of the national organization, so that these two parts of our work can now develop side by side.

The Women's Gas Council is now represented on the following: British Federation of Business and Professional Women, British Management Council, British Standards Association (Domestic Gas Appliances Committee), League of Nations Women's Advisory Council, National Council of Women (Housing and Household Service Sub-Committees), National Safety First Association, National Union of Townswomen's Guilds (Housecraft Advisory Committee), National Women Citizens' Association, People's League of Health, Lay Council, Women's Advisory Housing Council, and Women's Employment Federation, and among other organizations with which we have also co-operated are the following: Association of Teachers of Domestic Subjects, British Broadcasting Corporation, Housing Centre, Ministry of Labour, Central Committee on Women's Training and Employment, London Federation of Girls' Clubs, National Council of Girls' Clubs, National Smoke Abatement Society, and the Research Co-ordination Committee of the Engineers' Study Group.

In many cases the branches have co-operated with local branches of these organizations.

The Organizing Secretary has during the last year visited various parts of the country with a view to branch formation, and in certain areas considerable advance could be made with the assistance of an Area Organizer free to devote time to their development. It is hoped, therefore, that it may soon be possible to appoint someone to form Area Federations in these districts with units in a number of towns in each.

Summer School for Demonstrators.

A Summer School for Demonstrators was held from Sept. 11-15, 1936, at the Cardiff Training College of Domestic Science, by kind invitation of the Principal, Miss E. M. Davies, B.Sc., and the Senate of Cardiff University.

Plans are now in course of preparation for the second Summer School which is to be held at King's College of Household and Social Science, London, from Sept. 17-21, 1937.

Following the experimental course in Gas Cookery Demonstration last year at the Battersea Polytechnic, Miss Masters, the Principal of the Domestic Science Department, has now extended the course to cover a full year of two evenings a week.

At the end of the year in June, students will take an examination which will form the first part of the Diploma to be awarded by the Women's Gas Council after a satisfactory period of practical experience with a gas undertaking.

A new development in our work this year has been the formation of the first Demonstrators' Circle. This was inaugurated on Jan. 18, 1937, and is called the London and Home Counties Demonstrators' Circle. It is hoped that further Circles will be started in those areas where the number of demonstrators justifies the formation of a Circle.

Another Educational Course under the title "Gas Homecraft" has been started by the South-East London Technical College where the Principal of the Domestic Science Department, Miss Seton, has co-operated with the Women's Gas Council in drawing up a syllabus which, while less comprehensive than the Gas Demonstrators' Course, should prove useful to students proposing to take up work in Gas Showrooms, and also to those to whom a knowledge of gas appliances will be of value in their future work, either in their own homes or elsewhere.

Educational Work.

(*a*) *Lectures.*

In May last, Miss A. M. S. Wilson, B.Sc., joined the staff in order to undertake the editing of the magazine and to lecture to branches and other organizations.

Over fifty lectures have also been given to various clubs and societies by Mrs. Lidderdale on "Woman—the Builder," a talk specially prepared and delivered for the Women's Gas Council. Headquarters keeps a panel of lecturers suitable for Branch meetings, and fresh names are added from time to time. Articles have been written for a variety of papers, including *Women's Employment*, *Signpost*, *Housecraft*, and a series for the *Townswoman*.

(*b*) *Cookery Classes.*

This winter we have co-operated with the National Council of Girls' Clubs in offering Cookery Classes to London Girls' Clubs and the five started at Christmas have been so much appreciated that we were asked to continue these after Easter. It is hoped that this offer can be repeated and, if possible, extended in the autumn.

(*c*) *Films.*

During the autumn three film programmes were given to audiences of representatives from women's organizations at the Building Centre. These films have also been shown locally both to branches and to other audiences.

In presenting this report, the Executive Committee feel that the year's progress shows a definite advance, and the enthusiasm in the various branches promises well for future development. The second year of work has proved that the Women's Gas Council has been built on firm foundations and the continued interest of members shows that it is filling a need among housewives all over the country.

In the absence of Councillor Mrs. Eric Evans, Miss RANDAL, in moving the adoption of the Report, congratulated Miss Halpin on the excellent progress of the Council and the large amount of work that had been carried out in such a short time. Mrs. W. N. SMETHHURST seconded the motion, which, together with the statement of accounts for the year ended March 31, 1937, was unanimously adopted.

Officers and Committee.

In stating the unopposed re-election of the Marchioness of Londonderry as President, Miss WOLSELEY-LEWIS re-

marked that she was at present abroad and they had therefore been unable to ascertain from her whether she was willing to stand for re-election, but that they might take it she would raise no objection. In electing Vice-Presidents mention must be made of the very great loss they had sustained by the death of Lord Moynihan; an eminent doctor, he had given a valuable guarantee of what the Council could do in the interests of public health. The following were elected Vice-Presidents of the Council on the proposition of the Chairman:

Miss Adler, C.B.E., J.P.	The Countess Jellicoe
Mrs. W. A. Cadbury	The Countess of Limerick
Lady Chatterjee, O.B.E. M.A., D.Sc.	Sir David Milne-Watson, D L., LL.D.
Lady Davis	The Dowager Lady Nunburnholme, J.P.
Lady Duckham	Sir Isidore Salmon, C.B.E., D.L., J.P., M.P.
Lady Emmott, J.P.	Lady Steel-Maitland
Miss Faithfull, C.B.E.	Lady Sydenham of Combe
Mrs. A. S. Giles	Lady Woodward
Sir Francis Goodenough, C.B.E.	
Lady Humphries	

It was announced that the following members of the Executive Committee would remain in office:

The Lady Ruth Balfour, M.B., B.S.	Mrs. A. L'Epine Smith
Mrs. Cottington-Taylor	Mrs. Fred Taylor
Miss M. B. Francis	Miss E. Webster
Miss E. Kirkby	Miss Ethel Willans, M.B.E.
Miss A. M. Mathias	Miss C. E. Ellington-Wright, M.B.E.

the remaining five members being elected by ballot, the result of which was as follows:

Miss O. L. Humphries	Mrs. O. Roberts
Mrs. E. Iredale	Miss M. M. Robinson
Miss D. E. Palfreman	

The Council's Auditors (Messrs. Cash, Stone, & Co.) were duly reappointed for the ensuing year.

In rising to introduce Lady Ruth Balfour, the Countess JELLICOE congratulated the Gas Light and Coke Company on the conception of their recently inaugurated scheme at Kensal House which was making life so much more easy and safe for poor families. Lady Ruth, she said, was a very talented person, and it was a pleasure to ask her to speak to them to-day on "Right Feeding and its Preventative Aspects;" a fully fledged doctor, she could speak with great authority and from experience.

Lady Balfour's Address.

Commencing her Address, the Lady RUTH BALFOUR said she had come to speak to them on a subject which was of universal interest throughout the civilized world. What she was going to tell them was the result of limited study arising from a visit, as delegate of a Public Health Committee, to an International Conference of Women, when a resolution was passed that every country represented should do all it could to assist the experts in the practice of right feeding. One of the ways of doing this was to talk about it and spread the knowledge, but first she would like to pay a tribute to the work the Council had already done, including the Nutrition film and the housing scheme which was an essential part of health policy.

The days were long past when disease was considered to be a manifestation of the wrath of God, or, over a 100 years ago, a thing meriting isolation and even death. At that time epidemics, the result of crowded and unhygienic living conditions, had been regular occurrences every 12 years or so, but the development of ideas in regard to sanitation in later days had dealt with the epidemic so successfully that cholera, typhus, &c., were unknown in this country. Sanitation had been followed by inoculation —prevention instead of cure—and the early practice of inoculation had almost wiped out smallpox.

To-day, continued Lady Ruth, the aim of the experts was to make people healthy and physically fit. The old idea of food was that it merely prevented starvation, but they had found that disease was often actually caused by starvation. For instance, scurvy, the first disease in this country to receive real attention, was first alleviated in 1750 by a naval surgeon who discovered that a diet of fresh fruit could effect a cure; the cause of the disease, as we now know, being the absence from the sailor's diet of Vitamin C, which is contained in this fresh fruit and all green vegetables. It had consequently been proved that other diseases were also due to this form of starvation, and all these could now be cured in most cases by the application of their knowledge of the vitamins. This kind of case had been a pointer to the solution of some minor troubles by discovering a partial deficiency of vitamins; in the Rhondda Valley mothers and mothers-to-be had been fed with extract of yeast, and it had been observed that as a result both the confinements were easier and the children more healthy. As a result of this research tremendous advances had been made during the last 20 years, and it had been definitely established that if the diet did not contain a sufficient amount of the necessary vitamins and mineral salts for energy and body-building, loss of weight and deficiency diseases would result. But excess could be as bad as deficiency, as was shown in diabetes, and certain cases of rheumatism which were due to an excess of protein; for example, there was a tribe in Kenya which subsisted entirely on animal food, and suffered excessively in old age from rheumatism; while in the Mediterranean countries, where a great deal of fruit and vegetables is eaten, rheumatism is practically unknown. It was thus indicated that the diet should be balanced, and in relation to the work done, heavy manual labour requiring more food to be taken. But in all cases excess was as bad as too little.

The factors of a proper diet were contained in meat (or fish, or cheese, or milk), potatoes, and a little bread. The League of Nations had started a Nutrition Committee which recommended every Government to appoint its own committee, and the British Government had been the first to do this. Extensive surveys had been made in certain areas, experiments observed, and they had reached a general conclusion that the general diet was very much better than it used to be, but that those people who could not afford everything to eat they would like were in the habit of cutting down the green vegetables and fruit; these being less "filling" than the other foods, their value was not realized. Propaganda, said Lady Ruth, must be undertaken to convince them of these values, and people who were unable to obtain the necessary vitamins should have their diet supplemented by local Public Health Committees, since everybody had a right to be properly fed with the right constituents. But first the people had to be educated to make the best use of what they *could* get. A plea should be made for certain items of diet which had always been neglected by the poorer household; skimmed milk was recommended, and fish, which, although cheap and easily available in most areas, was consistently ignored by all but a small percentage; while those who possessed garden plots could be taught to cultivate lettuce and cabbage. With reference to cooking she was not an expert, but she thought it deplorable how much of the value of food was generally lost in the cooking, especially in the case of potatoes where all the mineral salts were lost with the peeled skin. Again with green vegetables, cooking destroyed the vitamins and all the goodness got into the water which was eventually thrown down the sink; she suggested it would be better to drink the water and throw away the cabbage! In conclusion, the W.G.C. could do a lot of good work in getting into the homes of the people and showing them what they could do to benefit themselves, and she was sure there was no body of women in the country doing better work than they.

Miss FAITHFULL, C.B.E., said that her experience in running a kitchen was not that of the speaker, in that she had found green vegetables were much in demand. The difficulty was that the commodity was so very expensive in the market, and she thought the most beneficial thing that could be done would be to reduce the price of this necessary factor. It had been interesting to her to educate the poorer people into liking dishes which they had begun by disliking; it was difficult to vary the diet with the small range of comestibles available to their pockets, but while she had converted them to macaroni cheese and even to curry, they still considered it an insult to be offered a potato in its skin.

Another MEMBER asked what were the supplementary foods which the speaker had said were to be provided by local committees.

Lady RUTH replied that at present the effort to supplement the diet was centered on milk, which was generally considered the perfect food. Milk was being supplied to schools, &c., at one third the normal price, although unfortunately for various reasons not more than half the intended recipients care to take it. Also, every local authority was empowered to give school feeding, taking payment only from those parents who could afford to give it. The food had to be watched to make sure it was properly balanced, and many areas had been criticized on this score; they should endeavour if possible to work in conjunction with the public authorities.

In proposing the vote of thanks, Lady WOODWARD said that before they all went home to put into practice the ideas they had heard she would like to put on record their cordial thanks to the Gas Industry for making the occasion possible. She herself had grown up under what she might call experimental food conditions; proper education from the beginning was all that was necessary, and they all had the opportunity of carrying out such good advice.

Mrs. ROBERTS seconded the vote of thanks, and the meeting concluded with a vote of thanks to Countess Jellicoe for her great interest and kindness in taking the Chair.

THE PRODUCTION AND PERFORMANCE OF Domestic Coke

by
Dr. W. DAVIDSON
(of Radiation, Ltd.)

From a Paper read before members of the Scottish Junior Gas Association (Western District) at a meeting held at Glasgow on Saturday, March 27.

It will be unnecessary to state here the many advantages resulting from the use of smokeless fuel for domestic purposes. The London and Counties Coke Association, the leading gas undertakings, and the Smoke Abatement Society have advertised these widely and shown the harmful effects of smoke and the very great extent to which the domestic coal fire contributes to smoke production. These organizations have done much to popularize the use of coke for open coke grates and the sales of domestic coke are increasing steadily. This is especially so in the South and Midlands of England, the larger gas undertakings being fully alive to the great potentialities of the domestic market. There is undoubtedly a general desire for an atmosphere free from smoke, but unless smokeless fuel will give a performance equal to that of coal at no extra cost there would be little hope of it being widely adopted. The quality of many domestic cokes has, however, been greatly improved, and these give excellent performances when burned in specially designed coke grates.

When it is realized that over 20 million tons of coal are still burned annually in domestic appliances the magnitude of the task of supplying this most exacting market with smokeless fuel will be appreciated. This problem is being attacked from two different angles. The first is the production of a very combustible coke which will burn satisfactorily in the usual types of coal grate. The second method of attack is to produce a special type of grate which will burn the comparatively unreactive high-temperature cokes at present produced at gas-works and coke ovens.

Production of Highly Combustible Coke.

The combustibility of coke decreases as the temperature of carbonization is increased, a very marked change occurring between the temperatures of 700° and 750° C. A new industry has begun for the production of low-temperature coke at temperatures below 750° C., and this fuel is suitable for burning in the ordinary types of coal grate. Some progress has been made but the success has been limited, and it is doubtful whether this new industry will ever make more than a very small contribution to the problem of supplying the domestic market with smokeless fuel. The reason does not lie in the fact that the fuel produced is unsuitable, since several give good results, but in the fact that the methods of manufacture are costly and a comparatively high price must be obtained for the fuel.

Coal being a very poor conductor of heat, it is necessary to have very narrow widths of coal charge when using the low flue temperatures essential for low-temperature carbonization in order to obtain a reasonable throughput. Even with very narrow retorts, however, the output is small and the cost of production is therefore comparatively high. The rate of carbonization increases so rapidly as the flue temperature is increased that when using moderate and high flue temperatures greater widths of coal charge may be carbonized at faster rates than the narrow charge of low-temperature retorts, and the outputs are therefore very much greater.

The cost of carbonizing coal therefore decreases with increase of the temperature of carbonization, and much attention has therefore been given to the manufacture of easily combustible domestic coke at medium and high temperatures. The coke produced by the usual methods of high-temperature carbonization in gas retorts and coke ovens is too difficult to ignite and burn in ordinary open grates. Much research is now being carried out to investigate the possibility of increasing the combustibility of high-temperature coke by blending the coal with "activators" such as calcium *plus* sodium carbonates. A great increase in the reactivity of the product is obtained by the addition of 2 or 3% of the activator to the coal, and if this material does not damage the retort and oven linings, &c., this method may meet with much success. A more effective activator may yet be found, and it is also possible to lessen the quantity of activator required by carbonizing at slightly reduced temperatures.

Manufacture of Domestic Coke in Ovens.

A preliminary investigation was made of all the cokes made in ovens in Scotland. It was found that several of these cokes if suitably screened were excellent fuels for slow combustion stoves and domestic boilers. Even the most combustible of them, however, was quite unsuitable for burning in an open grate. They were too difficult to kindle and required too long a period to give a bright fire after refuelling. Moreover, since these cokes are made from crushed coal, the ash is finely divided and not only spoils the appearance of the fire by forming a covering over the pieces of coke, but finds its way into the room each time the fire is raked.

The detrimental effect of a finely divided ash on the performance of a coke in an open grate was so pronounced that it was considered that uncrushed coal should be used for the manufacture of domestic coke. It has sometimes been recommended that uncrushed coal screenings from 0 up to about 3 in. should be used. The present series of tests was made to determine the effect of varying the size of the coal and the carbonizing period and temperature on the combustibility of the resultant coke.

The cokes were made in an experimental coke oven 30 in. long, 30 in. high, and 14 in. wide which carbonized a charge of 7 to 8 cwt. of coal. The oven was constructed in a similar manner to large scale ovens and the flue temperature could easily be controlled. The coke was discharged by means of a small hand ram and water quenched.

For this series of tests the treble, double, and single nuts of two Scottish coking coals, one (No. 1) having a low volatile matter content, and the other (No. 2) having a high volatile matter content, were carbonized in the experimental oven. The uncrushed 0-3 in. screenings of coal No. 1, and for comparative purposes the crushed drosses of both coals and the crushed 0-3 in. screenings of coal No. 1, were also coked. Each oven of coke was screened and shatter tests were made on a representative sample. The chief results are recorded in Table I.

These results show that the size and resistance to shatter of the coke tends to increase as the size of the nut coal is decreased in the case of each coal, and that the screening and shatter indices of the cokes made from the lower volatile coking coal No. 1 are much higher. The shatter indices of the cokes made from these nut coals are, as expected, lower than those obtained from the coke made from the corresponding crushed coal, but these cokes would be strong enough to withstand much breakage if used for domestic purposes.

The ½ in. screening indices—that is, the yields of breeze from the oven—do not vary much with the size of the nut coal, but the percentage of breeze on handling would be greater, especially in the case of the cokes from the nut sizes of coal No. 2. It should be noted, however, that the shatter test was devised to reproduce the handling a coke would receive from the time it leaves the coke oven plant until it is charged into the blast furnace or cupola, and is much more severe than that to which a domestic coke would be subjected.

In all tests the same volume of coal was charged to the experimental oven, and it should be noted that the weight of the charge increased appreciably as the size of the coal nuts was increased.

Open Grate Tests.

A standard 14 in. open grate was used, provided with two horizontal curved front bars 3 in. high, which, with the 2 in. well of the bottom grate, enabled a fuel bed 5 in. high at the front and about 9 in. high at the back to be used. The depth of the fire was 7 in. at the sides and 10 in. at the centre. The chimney draught was kept constant at a moderate value for each test by means of a fan placed in the flue.

A water cooled Cambridge thermopile of the Moll type and galvanometer, calibrated to give the radiation in B.Th.U. falling on 1 sq.ft. area situated 51 in. from the

TABLE I.—*Results of Experimental Oven Tests on the Coking of Uncrushed Coals.*

Coke No.	Coal Used.	Weight of Air-Dry Charge. Lb.	Moisture in Charge, %.	Flue Temp., °C.	Coking Period, Hrs.	Proximate Analysis of Coal, Air-Dried.			Screening Indices of Cokes.					Shatter Indices of Cokes.			
						Moisture, %.	Ash, %.	Vol. Org. Matter, %.	4 In.	3 In.	2 In.	1 In.	½ In.	2 In.	1½ In.	1 In.	½ In.
1 (c)	0–3 in. of coal 1 crushed to 0–½ in.	811	3·5	950	20	1·0	7·1	26·2	66	80	93	97	97·5	83	93	97	98·6
1 (c)1	0–3 in. of coal 1 crushed to 0–½ in.	807	4·5	1,100	16	1·1	7·2	26·0	58	80	94	97	97·0	85	94	97	98·5
1 (u)	0–3 in. of coal 1 uncrushed . .	868	8·2	950	20	1·0	7·0	26·0	62	79	90	97	97·7	73	85	92	96·4
1 (t)	Trebles of coal 1 uncrushed . .	896	3·2	950	20	1·0	3·2	25·8	59	71	86	96	97·8	67	81	91	96·2
1 (t)1	Trebles of coal 1 uncrushed . .	898	3·0	1,100	16	1·0	3·2	25·8	59	75	87	97	98·2	66	82	92	96·4
1 (d)	Doubles of coal 1 uncrushed . .	880	4·7	950	20	0·9	5·1	25·3	65	81	89	95	96·4	65	79	92	95·4
1 (d)1	Doubles of coal 1 uncrushed . .	879	3·5	1,000	18	0·9	5·1	25·3	68	81	90	97	98·1	68	79	90	96·2
1 (s)	Singles of coal 1 uncrushed . .	842	5·4	950	20	1·1	6·6	26·5	86	89	94	97	98·3	72	82	90	95·8
1 (s)1	Singles of coal 1 uncrushed . .	840	5·6	1,100	16	1·1	6·6	26·5	74	87	93	97	98·5	78	87	93	96·6
2 (c)	0–3 in. of coal 2 crushed to 0–½ in.	..	2·9	1,000	18	2·0	3·5	34·5	20	38	75	95	96·0	55	78	92	97·2
2 (t)	Trebles of coal 2 uncrushed . .	..	2·0	1,000	18	1·8	3·2	34·8	37	51	73	94	95·4	43	65	82	93·9
2 (d)	Doubles of coal 2 uncrushed . .	..	2·8	1,000	18	2·0	6·8	34·0	44	56	74	93	94·7	38	52	76	92·4
2 (s)	Singles of coal 2 uncrushed . .	..	3·0	1,000	18	1·9	8·8	34·1	77	82	88	94	95·6	50	60	77	90·8

centre of the grate, was used to determine by the "Leeds" method the radiant efficiency of each fire.

As a result of the tests described by H. Hartley and A. R. Bennett ("GAS JOURNAL," Dec. 2, 1936, Vol. 216, p. 661—"An Integrating Method for the Measurement of the Total Radiation emitted by Domestic Heaters") it would appear that the radiant efficiencies obtained by means of a thermopile are open to question, but it should be noted that this does not lessen the value of these tests, since they are strictly comparative, being carried out in exactly the same manner. An integrating radiometer is being used for all future work.

In each test the fire was made up in the usual way. The paper and wood were placed in the grate, and on top of this the unburnt fuel remaining from a previous fire of the same sample. Sufficient fresh fuel was then added to give a total of 12 lb. The fire was then kindled, and the time required for the fire to attain a certain brightness (determined by a definite reading of the thermopile) was observed. The fret was then closed, no air being admitted to the ashpit, to allow the fire to keep radiating for as long a period as possible, above this given value for a bright fire. When the radiation decreased to that value the ash was removed from the fire, 7 lb. of fuel added, and the fret opened. This addition of fuel usually filled the grate. The time required for the fire to become bright again was noted, when the fret was again closed and the above procedure repeated.

Effect of Size of Coal.

The chief results of the open grate tests on the cokes made from uncrushed coals Nos. 1 and 2 are shown in Table II.

It was found that the coke made from the treble nuts of coal No. 1 was the best domestic fuel so far examined. It was very easily kindled, only ½ lb. of wood being required, the fire recovered very quickly after replenishing, only a small quantity of unburnt fuel and ash remained, and the radiant efficiency was the highest yet obtained. The 1-3 in. size of this coke gave a more attractive fire than the 1-2 in. size, and, moreover, it kindled quicker. The 2-3 in. size of this coke used in Test No. 5 was much more difficult to kindle and did not burn brightly, and therefore gave a greatly reduced efficiency. This size therefore provides too small a surface area for coke of this combustibility to burn brightly enough to give a high radiant efficiency, the pieces of coke at the front of the fire remaining dull and screening off the radiation from the pieces in the heart of the fire which burn more brightly.

The coke made from the double nuts was a little more difficult to kindle, but nevertheless gave very good results, and that from the single nuts was again slightly less combustible.

The most surprising results were those obtained from the coke made from the 0-3 in. uncrushed screenings. This was the poorest open grate fuel of the series, being the slowest to kindle and recover after refuelling. Coke No. 1 (*c*) made from the crushed 0-3 in. screenings of the same coal gave results intermediate between those obtained from the coke made from the uncrushed 0-3 in. screenings and those made from the single nuts.

One of the most important points brought out by these tests was the effect which the state of division of the ash had on the appearance of the fire. As the size of the coal was reduced the fineness of the ash and its detrimental effect were increased.

TABLE II.—*Results of Open Grate Tests.*

[Width of Grate, 14 In.]

Test No.	Fuel No.	Ash, %	Volatile Organic Matter, %	Net Calorific Value. B.Th.U./Lb.	Size of Fuel, In.	Weight of Wood Used to Kindle. Lb.	Time to Give Bright Fire. Min.	Time to Recover After Charging 7 Lb. Fuel. Min.	Weight of Unburnt Fuel. Lb.	Rate of Combustion. Lb./Hr.	Radiant Efficiency. %
1	1 (c)	7·6	2·8	13,100	1–3	1	45	23	3·8	2·2	25·0
2	1 (c)	7·6	2·8	13,100	1–2	1	46	20	3·0	1·9	25·6
3	1 (u)	7·5	4·2	13,080	1–3	1	70	26	3·8	2·5	21·4
4	1 (t)	3·8	4·1	13,640	1–3	½	42	17	2·8	1·8	32·3
5	1 (t)	3·8	4·1	13,640	2–3	½	105	23	3·0	1·6	19·9
6	1 (d)	5·6	2·6	13,480	1–3	½	40	17	3·0	2·1	28·4
7	1 (s)	7·4	3·3	13,150	1–3	½	47	18	2·3	2·3	27·7
8	1 (s)	7·4	3·3	13,150	1–2	1	43	21	3·0	2·1	28·1
9	2 (c)	4·2	4·5	13,400	1–3	1	59	25	2·5	2·5	26·0
10	2 (t)	3·9	3·2	13,650	1–3	½	35	18	2·5	1·9	29·4
11	2 (d)	7·7	4·2	13,040	1–2	½	27	20	1·7	1·9	30·3
12	2 (d)	7·7	4·2	13,040	1–3	½	36	20	2·3	2·3	25·8
13	2 (d)	7·7	4·2	13,040	1–2	½	46	21	2·1	1·9	27·3
14	2 (s)	9·5	3·9	12,980	1–3	½	45	19	3·0	2·3	27·5

Similar results were obtained from the examination of the cokes made from the treble, double, and single nuts and the crushed 0-3 in. screenings of coal No. 2. Again the cokes made from the coal nuts were more easily kindled and gave higher efficiencies than that made from the crushed coal. The coke made from the treble nuts was again a little more combustible than that made from the double and single nuts.

Structure of Cokes Made from Nut Coal.

The structure of the cokes obtained from the uncrushed coal nuts was quite different from that made from crushed coal. Pockets of much larger pored coke could be observed throughout each piece of coke, and these were more pronounced in the case of the cokes made from the larger treble nuts. During the coking process the plastic material is extruded on to the surface of each piece of coal and fills up the voids of the coal charge, and when coked this plastic material gives a large pored coke of low density.

The kindling tests carried out showed that as the size of the coal nuts was increased the easier was the kindling of the resultant fuel. It is also apparent that the greater the size of the coal nuts the greater will be the size of the voids, and, therefore, the pockets of very porous coke, although these will be fewer in number, and the less will be the uniformity of the resultant coke. It is therefore probable that these pockets of very porous coke determine the ease of kindling of the coke.

The coke made from the crushed coal possessed a uniform structure and had no pockets of very porous coke to assist the ignition. The structure of the coke made from the uncrushed 0-3 in. coal screenings was similar to that made from the crushed coal with parts of much denser coke, formed from the uncrushed pieces of coal. These parts of dense coke will account for the fact that coke made from uncrushed 0-3 in. coal is more difficult to kindle than that made from the same coal when crushed.

The results given in Table II. show that as the size of the nut coal was increased the bulk density of the charge was also increased, allowing a greater weight of coal to be charged to the oven. Therefore, the coke made from these nuts, and especially the larger sizes, will consist of very dense coke with pockets of porous coke distributed throughout. This very dense coke was very unreactive to carbon dioxide, only a trace of carbon monoxide flame being apparent on the surface of the fire as it burned, and this fact must contribute to the high radiant efficiency obtained from this type of coke, since highly reactive cokes give comparatively low radiant efficiencies.

Another factor which greatly influences the radiant efficiency of the coke made from treble coal nuts is the nature of its ash. Besides being very low in quantity it is dense and is not evenly dispersed throughout the coke pieces. When the pieces of coke burn rapidly and become incandescent the denser ash falls from the surfaces of the coke, and therefore a less proportion of the radiation is screened off than is the case with cokes made from crushed coal, the ash of which is finely divided and adheres closely to the surfaces of the coke. Again, the ash of the cokes made from nut coal does not hinder the supply of air to the burning coke to as great an extent as the fine ash of cokes made from crushed coal. This explains why the former cokes give a more uniform rate of burning and therefore rate of radiation.

Having established the fact that the combustibility and radiant efficiencies of the resultant coke can be greatly increased by carbonizing uncrushed coal nuts, the next step was to determine the effect on the properties of the coke of varying the carbonizing temperature and period, and so find the optimum conditions for the manufacture of domestic coke in ovens.

Effect of Carbonizing Temperature and Period.

Accordingly, a series of experimental oven tests were made and the treble nuts and a mixture of 50% of double with 50% of single nuts of coal No. 1 were carbonized, using flue temperature varying from 800° to 1,000° C.

The cokes were again examined when burned in the standard open grate used for the previous series of tests, but for the present series the width of the grate was reduced to 12 in. to make the test conditions more exacting. The chief results are given in Table III.

(a) Cokes made from Treble Nuts of Coal No. 1.

Coke No. 4 made at the lowest temperature was slightly undercoked and it was the easiest to kindle, recovered most quickly after refuelling, and gave the lowest weight of unburnt coke at the end of the test. Coke No. 5 was made at a slightly higher temperature, but was very much overcoked, and this increase of the coking time reduced the combustibility of the coke. Coke No. 6 carbonized in 17 hours at 930° C. was an excellent open grate fuel. It had received the correct coking time and was strong, kindled and recovered quickly after refuelling, and burned with a high radiant efficiency.

(b) Cokes made from 50% double plus 50% single nuts of Coal No. 1.

This mixture of coal nuts required a slightly longer coking period than the treble nuts. Cokes Nos. 7 and 9 were both undercoked and were much more combustible but weaker than the correctly carbonized coke No. 8. Comparing coke No. 8 with coke No. 6 made at approximately similar temperatures, it is observed that the latter, made from treble nuts, is the more combustible and efficient.

Full Scale Oven Cokes.

To determine the effect on the resultant coke of carbonizing coal nuts at temperatures above 1,000° C., a full scale 14 in. silica oven was used. Using flue temperatures of 1,030°, 1,100°, and 1,300° C. cokes Nos. 10, 11, and 12 were made from the treble nuts of coal No. 3.

The results of the open grate tests recorded in Table III. show that as the flue temperature was increased the combustibility and the radiant efficiency of the resultant coke was considerably decreased.

Reviewing the results which have been obtained from the open grate tests of cokes made from nut coal, it is apparent that these cokes are much more combustible and efficient and are in every way superior open grate fuels to those made under the same carbonizing conditions from the same coals when crushed.

The highest radiant efficiencies have been obtained from cokes made from treble nuts in 14 in. ovens using a flue temperature of about 1,000° C. Those made at higher temperatures are less efficient because they are not com-

TABLE III.—*Analyses of Experimental and Full-Scale Oven Cokes Made at Different Flue Temperatures, and Results of Open Grate Tests.*

Open Grate Test No.	Description of Coke.	Moisture, %.	Ash, %.	Volatile Organic Matter, %.	Net Calorific Value, B.Th.U./Lb.	Size of Fuel Used, In.	Weight of Wood Used to Kindle, Lb.	Time to Give Bright Fire, Min.	Time to Recover After Charging 7 Lb. Fuel, Min.	Weight of Unburnt Fuel, Lb.	Average Rate of Combustion, Lb./Hr.	Radiant Efficiency, %.
	Experimental oven cokes—											
	(*a*) Made from treble nuts of coal 1—											
15	4 (18 hours at 800° C.)	3·9	3·5	5·0	13,200	1–3	¾	35	16	2·3	2·2	27·8
16	5 (23 ,, 850° C.)	3·6	4·7	3·8	13,000	1–3	½	40	20	3·5	2·1	27·1
17	6 (17 ,, 930° C.)	3·5	3·9	4·3	13,160	1–3	½	37	18	3·0	2·2	29·1
	(*b*) Made from 50% double *plus* 50% single nuts of coal 1—											
18	7 (18 hours at 800° C.)	2·7	5·8	5·1	13,200	1–3	½	39	15	3·1	2·1	26·8
19	8 (20 ,, 900° C.)	3·6	6·1	4·8	12,820	1–3	¼	45	17	3·2	2·2	27·1
20	9 (17½ ,, 1,000° C.)	3·2	5·3	5·8	13,250	1–3	⅛	35	16	3·3	2·3	26·6
	Full scale oven cokes—											
	(*a*) Made from treble nuts of coal 3—											
21	10 (17 hours at 1,030° C)	1·5	4·7	2·2	13,250	1–3	⅛	38	17	3·0	2·1	30·7
22	11 (16½ ,, 1,100° C)	0·8	5·0	1·6	13,380	1–3	½	50	21	3·3	2·0	29·1
23	12 (12½ ,, 1,300° C)	1·4	4·1	1·2	13,300	1–3	1	4⅝	22	4·3	2·0	26·3

bustible enough to give rapid kindling and recovery of the fire after refuelling. Cokes made at the highest temperatures are so incombustible that only the coke in the heart of the fire becomes incandescent, and this is surrounded by dull pieces which screen off the radiation. Cokes made at flue temperatures below 1,000° C. are more reactive and, therefore, burn less efficiently. The optimum conditions for the preparation of a domestic coke in ovens would therefore appear to be to carbonize treble nuts of a coking coal in 14 in. ovens using flue temperatures of 1,000° C. and a carbonizing period of 16 hr.

(To be concluded.)

Midland Junior Gas Association at Royal Leamington

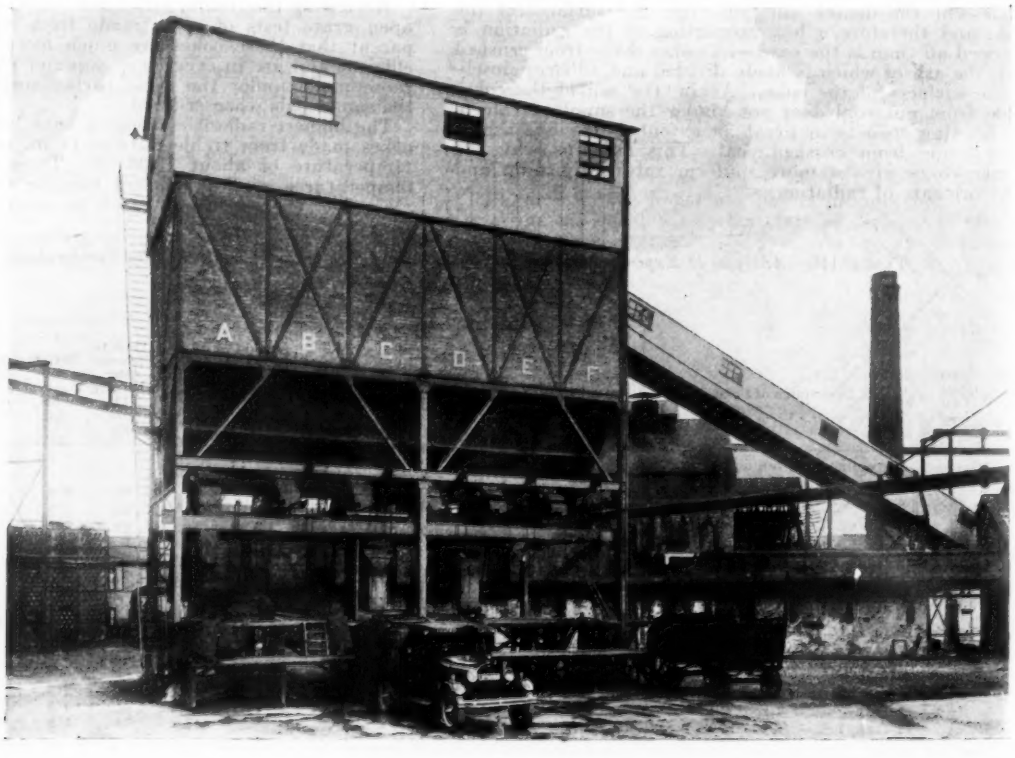
Guests of their President's Company.

The Midland Junior Gas Association were the guests of the Leamington Priors Gas Company, of which their President, Mr. F. A. Jenkins, is the Assistant Engineer and Sub-Manager, on Saturday, April 17.

The Works of the Leamington Company possess many features of more than passing interest to the Juniors; their development has been consistent with the great expansion of the Company's business. As some indication of this expansion it may be mentioned that in 1871, when the population of the town was 20,900, the sales of gas amounted to 69 million cu.ft., while in 1936, with a population of 30,000, the town consumed 414 million cu.ft.

The principal coal store is by the Company's railway siding, about half-a-mile from the Works, where there is sufficient space for about 3,000 tons. In the carbonizing unit there are 32 continuous vertical retorts of the Glover-West steaming model, arranged in units of four and in settings of eight, and it is housed in a building of steel-framed construction, but completely encased in brick. A hopper of five tons capacity receives coal on delivery to the Works, and from the mouth of the hopper the coal is mechanically fed at a regulated speed into a West single-roll breaker. Reduced to a suitable size, it passes into elevator buckets for transport to the uppermost of two strands of a West lip-bucket conveyor which extends over a battery of coke-storage hoppers and completely encircles the retort bench. The handling process is completed when the coal reaches the top strand of the lip-bucket conveyor, and is dumped into overhead storage bunkers, thence to descend by gravity into the retorts. Coke discharged from the mouthpieces below the retort-bench, after its mechanical withdrawal from the retorts by means of Glover-West coke extractors, can be taken by the same lip-bucket conveyor to the storage hoppers without suspending the coaling operation. Two important items of equipment in the retort house are a 20 cwt. electrically-driven lift and a waste-heat boiler installation. The boiler is of Spencer-Bonecourt horizontal fire-tube, induced draught design, and is capable of evaporating 8,000 lb. of water per hour from and at 212° F.

The coke hoppers are of steel and brick construction and have a total capacity in all compartments of 160 tons. These hoppers discharge on to a band conveyor which transports the coke to a small balancing hopper from which it can be taken directly on to an inclined band conveyor for transport to the grading plant or, alternatively, first passed through the cutter or by means of another shoot loaded into telpher skips for storage in heaps in the Works yard. Coke from stock is brought by the telpher to an overhead hopper alongside the cutter house, and thence by means of a feeder band to the coke cutter, and so on to the grading plant. The small coke from the retorts is removed by static screens and used in the producers, each of which is fitted with forced draught equipment.. The coke grader is of West's double deck balanced reciprocating type. There are three trays (3 ft. 6 in. wide)—one upper tray and one lower tray, with a third below it and rigidly secured to it. In the



The coke grading, storage, and bagging plant at the Leamington Gas-Works.

upper tray all except the large coke is removed and delivered to the lower tray for further screening. In the second tray there is a set of racks to remove the breeze and deliver it to the third tray for final screening. The second tray also contains a further set of racks to remove the small nuts. The battery of brick and steel hoppers measures 40 ft. by 20 ft. by 39 ft. high, and is divided into six compartments. On each side is a movable A.C.E. dedusting unit. Coke taken away in carts is delivered direct to the vehicles and weighed-out coke is dealt with by a "Belle-Isle" weighing and bagging machine. All drives throughout the plant are electric, current being generated by one or other of two direct-coupled sets supplied with steam from the waste-heat boiler.

In addition to the coal gas plant there are two Humphreys & Glasgow carburetted water gas sets, each of a capacity of half-a-million cu.ft. per day. The Works has the usual condensing, exhausting, and purifying plant, the most recent addition being a steel water-cooled vertical tube condenser of 3 million cu.ft. per day capacity made by Messrs. W. C. Holmes & Co. The purifiers are of the water-lute type, and are in the open, being emptied and filled by a crane supplied with steam from the works boilers.

There are three gasholders, all column guided in brick tanks, two having flying lifts. The smallest is used as a water gas holder, and the two others have a combined capacity of 1,162,000 cu.ft. The two-lift holder has a rather unusual construction of the outer lift, and this holder, which is the largest in diameter, has painted on its crown for the information of air-craft pilots, the name of the town, together with an indication of the North cardinal point.

The sulphate of ammonia plant was designed for an output of three tons of salt per day, although it is now worked at a low rate in order to reduce the amount of effluent produced. A large underground tank has been constructed on part of the site of the old horizontal retort house to equalize the flow of effluent during periods when the sulphate plant is out of action. Tar for roads is sold to nearby road authorities, and is prepared in a Wilton dehydration plant reconstructed to bring its capacity up to 4,000 gall. of crude tar per 24 hours. The steam-raising plant on the Works consists of three Lancashire type boilers and the waste-heat boiler on the retort settings. The boiler feed water is softened in a Necker softening plant and filtered.

The General Offices are on the Works, but the showrooms is in the centre of the town. The Company owns 26 houses adjoining the Works, and most of them are let to employees.

Luncheon Speeches.

Before inspecting this plant, the Juniors were entertained at luncheon by the Directors of the Leamington Priors Company in the Manor House Hotel, where they heartily enjoyed excellent fare prepared in the all-gas kitchen of the hotel. The chair was taken by Alderman Harold Mason, M.B., J.P., Chairman of the Leamington Priors Company. Over 120 sat down to luncheon, including Chairmen of Committees of the Town Council, Government and local Government officers, and others prominent in the business life of the town.

The Loyal Toast having been honoured, "Royal Leamington Spa" was proposed in happy terms by Mr. A. W. Smith, F.C.I.S., General Manager and Secretary, Birmingham Gas Department, and responded to by the Mayor of Leamington (Alderman C. H. Southorn).

The Chairman proposed the toast of "The Midland Junior Gas Association." This Association, said Dr. Mason, had made a valuable contribution to the progress of the Gas Industry, which was an outstanding example of skilful administration, and the magnitude of its operations was clear testimony to the ability and foresight of its pioneers and of those who had been responsible for its direction for more than a century. Mr. W. A. Coleman, who supported the toast, said it afforded the Directors of the Leamington Priors Gas Company considerable satisfaction that one of their officials, Mr. F. A. Jenkins, was the President of the Midland Junior Gas Association.

The President, Mr. F. A. Jenkins, in response, recalled the formation of the Association 32 years ago, and mentioned that one of the founders was a former Engineer and General Manager of Leamington Priors Gas Company, the late Thomas Berridge. The Association paid its first visit to Leamington in 1907, and during its existence had done a great deal to further the interests of a great Industry.

Alderman R. F. Bury, M.R.C.S., L.R.C.P., J.P., Deputy-Mayor, proposed "The Leamington Priors Gas Company." The public, he said, were apt to take gas as a matter of course, and never gave full credit to the companies who produced it. Leamington had had gas since 1819, the present Company being incorporated in 1865.

Mr. R. S. Ramsden, Director, General Manager, and Engineer, replied. He spoke of the progress which the Company had made and of its recent developments. "I think Leamington appreciates that we try to give good service," he said.

"The Chairman" was proposed by Mr. F. Shewring, Engineer and Manager, Stratford-on-Avon Gas Department, and briefly replied to by Dr. Mason.

During the afternoon the members of the Association were conducted over the Gas-Works, and, in proposing a vote of thanks to the Directors for their hospitality, Mr. E. T. Pickering, Senior Vice-President, congratulated them upon the efficiency of their Undertaking.

Gas Undertakings' Results

Penrith.

For the first time in the history of the Penrith Gas Department the make of gas last year exceeded 100 million cu.ft. Commenting on the extraordinary development of the Undertaking at a recent meeting of the Penrith Urban Council, Mr. J. E. Newton, Chairman of the Gas Committee, said the make of gas in 1921 was 54 million cu.ft., in 1927 it was 70 million cu.ft., in 1932, 86 million cu.ft., and in 1936, 102 million cu.ft. In the past year the gas produced per ton of coal carbonized had been increased from 13,537 cu.ft. to 13,601 cu.ft., resulting in a saving of 35 tons of coal. The coke produced for sale showed an increase of 410 tons, and, on the comparative basis of the amount of coal used the previous year, that was equivalent to the production of 301 tons more coke in addition to the increased make of gas. These two items represented an estimated saving of £370. Sales of fittings for 1936 reached a record figure of £4,483. Mr. Newton paid a tribute to the sound management of the Council's Engineer, Mr. G. Hudson.

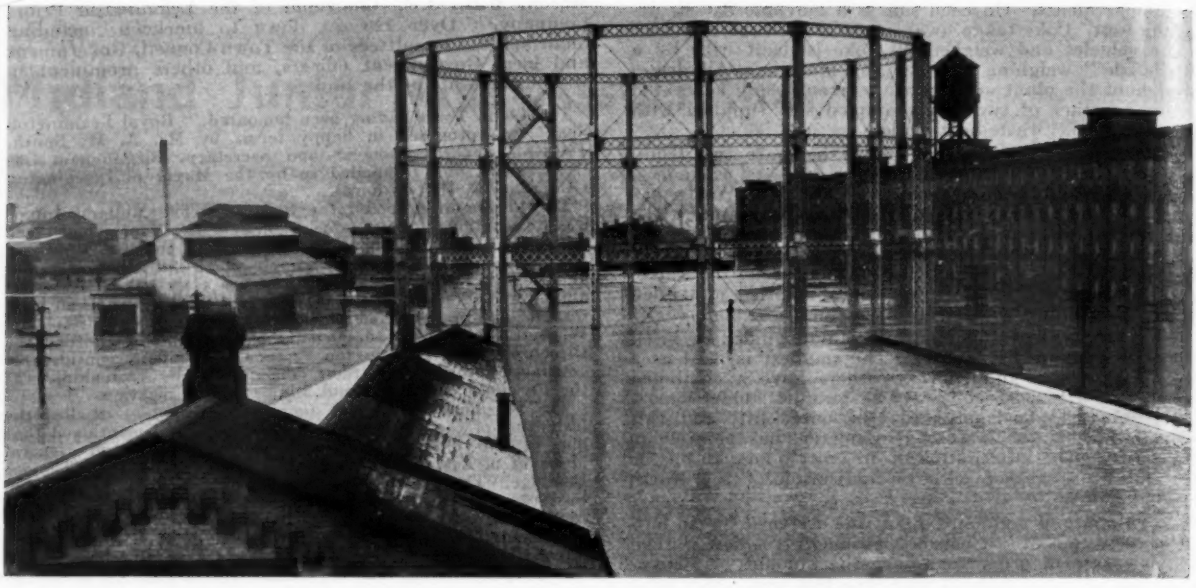
Severn Valley.

The Directors of the Severn Valley Gas Corporation, Ltd., which controls twenty-one West of England Gas Undertakings, recommend a final dividend on the ordinary shares of 2¾%, less tax, in respect of the half-year ended March 31, 1937, making with the interim dividend already paid a total dividend at the rate of 5½% per annum, less tax, on the ordinary shares from the respective dates from which they rank for dividend. This compares with a total of 5%, less tax, paid last year, and represents the first increase in ordinary dividend to be announced by a Gas Holding Company. The accounts for the year ended March 31, 1937, which were published on April 26, show that the Corporation has now a total issued capital of £1,112,860, of which £460,810 is in 4½% Cumulative Preference shares of £1 each, £552,050 in ordinary shares of £1 each, and £100,000 in deferred shares of £1 each. Investments in Subsidiary Companies amount to £1,158,494 of which £191,998 was acquired during the year. Total net revenue for the year after loan interest and other expenses, including taxation, amounted to £39,897. The carry-forward of £5,090 from last year brought the amount available to £44,987. Preference dividends for the year and the interim ordinary and deferred dividends paid on Oct. 1, 1936, absorbed £24,538, and after providing for the final dividends recommended on the ordinary and deferred shares the carry-forward is increased to £8,072.

South-Eastern.

The South-Eastern Gas Corporation, Ltd., reports a total revenue, including £124,336 from dividends and interest, of £154,583 for the year ended March 31, 1937. The corresponding figure for the previous year was £127,966, when dividends and interest brought £106,362. After allowing for Debenture interest, general expenses, tax, &c., net revenue amounted to £110,730 against £93,052, and, as already announced, the total Ordinary dividend for the year is maintained at 6%, £28,613 being carried forward. The issued and paid capital of the Corporation is £3,079,121, and is divided into £1,000,000 Redeemable 4½% Cumulative Preference shares, £498,818 Irredeemable 4% Cumulative Preference shares, and £1,580,303 Ordinary shares of £1.

The Gas Supply Did Not Fail



The West End Works of the Cincinnati Gas and Electric Company Under 25 Ft. of Water.

Through the courtesy of the Editor of the American *Gas Age-Record* we are enabled to reproduce the accompanying photographs and brief details of the recent disastrous floods which inundated the Ohio Valley and their effect upon the supply of gas in the district, which was maintained in spite of enormous handicaps and through the heroic work of all the personnel involved.

Above is how the Gas Company's building at Portsmouth (Ohio) appeared during the height of the flood; the flag on the top of the building was placed on the tent, illustrated on the opposite page, in which employees of the Company slept when the flood waters rose over the top floor. The photograph on the right shows employees of the Portsmouth Company rescuing gas meters. It was the waterproof mechanism of most of the meters which prevented a complete cessation of many consumers' supplies.

Though Ohio Valley Floods Inundated Both Works and District

In the recent unprecedented flood in the Middle West the waters of the Ohio and Scioto Rivers covered 6,000 of the 10,000 gas meters in the Portsmouth (Ohio) Gas Company's area of supply, but not all the consumers whose meters were covered suffered from a stoppage in the supply, because in many cases the meters were waterproof. Probably half the Company's consumers received gas service continuously throughout the flood, and the availability of gas for cooking and heating was a godsend to a city where flood waters rose to the second floor of buildings.

In the Sciotoville district three-quarters of the consumers retained their supply in spite of the fact that practically all the meters were under water. Heroic efforts on the part of the Company's employees enabled the service to be maintained. They worked for nights without any sleep but short naps, and most of the "field

The Superintendent of Meters at Cincinnati surveys the remains of the Meter Shop, which was flooded to a depth of 4 ft.

force" slept in the office building, gradually moving up as the waters rose, until they were finally bunking in a tent on the roof, as is illustrated in one of the accompanying photographs. Probably more than a hundred persons marooned in houses were rescued by Company employees.

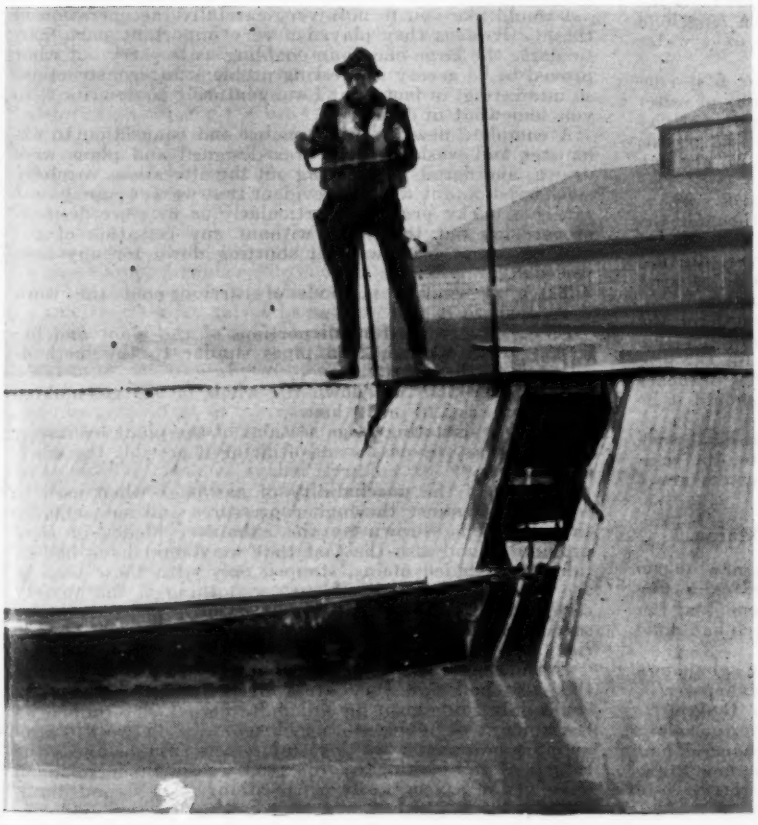
Most spectacular of the efforts to maintain the service was when certain street regulators developed such excessive pressure that they blew out their safety gauges, flooding the area with gas. Since there was a great deal of oil and gasoline floating over the flood waters from capsized tanks the danger of an explosion was serious. But the Manager of the Company and two of his men went out to the regulator houses in boats, cut holes through the roofs, and, groping in the gas-filled chambers, found the levers under water, which they were able to raise and reduce the pressure.

Before the waters covered everything employees of the Company saved many services by building extensions on drip pipes and removing meters before they were caught in the inundation. An emergency service was supplied on Feb. 3 to a local hospital and radio station by means of an overhead main carried on electric light standards. The Company distributes natural gas from fields in West Virginia, and fortunately the two main pipelines were unaffected.

In the area of the Cincinnati Gas and Electricity Company, too, a supply was continued to consumers in spite of enormous handicaps. The East End Gas-Works was swamped, and the Company had to sink all the purifiers, scrubbers, oil tanks, and one of the holders to prevent them being washed away by the strong current.

Gas supply was maintained in all districts where the low-pressure mains were not under too much water, and they lost only one isolated area through the wash-out of a levee. It is worth noting that both the city's electric power houses were shut down, as also was the water works —**BUT THE GAS SUPPLY DID NOT FAIL.**

Reconstruction work is now in hand, and this experience has proved to be the worst and at the same time the most interesting that has been undertaken by the gas undertaking. Many new engineering problems arose and were solved, and many thrills occurred.



Left —An employee standing on the roof of a valve and regulator house to operate a valve on an emergency natural gas line.

Below —Employees of the Portsmouth (Ohio) Gas Company slept in this tent on the top of the building when the flood waters rose over the top floor.

WESTERN JUNIOR GAS ASSOCIATION

Presidential Address

OF

S. B. JONES

(Assistant Engineer to the Clevedon Gas Company)

Presented at the Annual General Meeting of the Association held at Clevedon on Saturday, April 17.

THE PRESIDENT.

Educated at King Edward VI. Grammar School, Stourbridge, and Birmingham Municipal Technical School, Mr. Sidney Benjamin Jones received his early training as a metallurgical chemist at the Round Oak Steelworks, Brierley Hill, Staffs. After serving in the Air Force, he entered the Gas Industry as an articled pupil to Mr. F. C. Briggs, Engineer and Manager of the Dudley Gas Light Company, in 1921, becoming in 1924 Junior Assistant Engineer. He has held his present position of Assistant Engineer with the Clevedon Gas Company since June, 1926.

The first part of Mr. Jones' Address consisted of a description of the evolution of the Clevedon Gas-Works. Mr. Jones then gave a more detailed description of the reconstruction of the exhauster house and washing plant, as follows:

In the early part of 1936 we were fortunate enough to obtain a large industrial consumer whose ultimate consumption we estimated would increase the amount of gas to be made yearly by some 20%, and this, coupled with the fact that there was a strong possibility of an amalgamation with a neighbouring company whose output would increase our make a further 10%, made it increasingly obvious that something would have to be done to increase not only the capacity of our exhausting plant, but also to complete the replacement of all the old small mains and connections remaining in the exhauster house and to the washing plant.

When the new extension of Glover-West retorts was erected in 1934, the atmospheric condensers on the inlet to the exhausters had to be removed in order to make way for the new retort house, but owing to the extraordinary length of the 18 in. and 12 in. foul main from the vertical plants to the inlet of the exhauster house which provided ample condensing area up to the beginning of 1936, the reinstallation of the old condensers was found unnecessary.

With the increased makes required to meet the rising and anticipated further increase in consumption, it was thought advisable to enlarge the condensing area on the inlet to the exhauster by either increasing the length of the existing foul main or by the installation of a water tube condenser.

The question of a water tube condenser was first considered, but we found that some 7,000 gall. per day of water would be required, even after deducting 3,000 gall. per day which could be used on our boilers. This would have cost, with water at 1s. 2d. per 1,000, something like 8s. per day for water alone.

Schemes for overcoming this were put forward, such as circulating water from the gasholder tanks through the condensers, or the provision of cooling tanks and the recirculation of the cooled water. These, however, did not appeal to us, and it was finally decided to install, at least for the time being, additional atmospheric condensers.

This was done by further increasing the length of the foul main by some 150 ft. of 20 in. mild steel main, utilizing the branches left in the original foul main for the provision of water tube condensers, and inserting new branches in the steel main for a water tube condenser should it be required at a future date.

This additional length of condensing main has dealt very efficiently with the increased makes up to date, the temperature of the gas on the inlet to the exhausters never exceeding 60° to 70° F.

New Exhauster and Alterations to Mains.

This work consisted of the installation of a new 40,000 cu.ft. per hour capacity Bryan Donkin 3-bladed exhauster in place of the 15,000 cu.ft. per hour 3-bladed one, and the substitution of 12 in. mains for the old 8 in. which had done duty for some 50 years or more.

If you will refer to fig. 1 you will see that our exhausters prior to the alteration consisted of the above exhauster of 15,000 cu.ft. per hour capacity and a Bryan Donkin 2-bladed exhauster of 30,000 cu.ft. per hour capacity. Note also that one-half of the inlet main to the exhauster had already been enlarged. This was done when the new 12 in. foul main from the new extension of vertical retorts was installed in 1934.

Referring to the connections to the Cockey's washer and tower scrubber, you will see they were 8 in., and the inlets, outlets, and by-passing were controlled by the three rotary 4-way valves—that is, by turning these valves the order of the washer and scrubber could be reversed or either one or the other could be by-passed and put out of commission.

The 12 in. rotary valve, which I have lettered A, had inlet and outlet connections to an atmospheric condenser, which, after the installation of the new one on the inlet to the exhausters, was removed.

These rotary 4-way valves had been in use for a great number of years and leaked very badly on the rotary faces. The only way of repairing them would have been to close down the whole of the gas-making plant for, say, a day, and lift and reface, but as they were also too small they were removed when the alterations were carried out.

I would like you to note very carefully the operation of these valves, as they played a very important part, particularly the large one A, in enabling us to carry out what proved to be a very interesting problem in reconstruction, so interesting, in fact, that I am venturing to describe it to you somewhat in detail.

A complete new layout of mains and connection to exhauster and washing plant was designed and plans were drawn, and details of carrying out the alterations carefully considered, and it was soon evident that we were up against rather a tricky problem, particularly as we were desirous of carrying out this work without any cessation of gas making, or at least without shutting down for any long period.

Three alternative methods of carrying out the work were open to us:

First.—Bagging off small portions of the plant and by-passing with wrought-iron pipes similar to the methods adopted on the district.

Secondly.—Shutting down the whole of the gas-making plant for, say, 10 or 12 hours.

Thirdly.—Isolating large sections of the plant by inserting temporary by-passes and utilizing if possible the existing valves.

In view of the unreliability of gas bags when used in wet mains against the higher pressures and subjected to the pulsations thrown by the exhauster blades in close proximity, and also the fact that we should have had at times open-ended mains, stopped only with these bags in the exhauster house itself—to say nothing of the anxiety caused while the work would have been in progress under such conditions—the first method was considered far too risky.

Considering the second method we quickly realized that this also had two very great disadvantages. First, we could only shut down for a definite period, determined by the amount of holder storage, in our case between 6 a.m. and 6 p.m., and if by any unforeseen circumstances the return of gas making was delayed we should have found ourselves in a very awkward position. The second disadvantage of method 2 was that, owing to the extensive

nature of the alterations, it was doubtful whether they could be carried out at one shutting down.

Method 3 appealed to us, and was the one finally adopted, because at no time during the alterations would the section on which we were at work be under pressure, neither

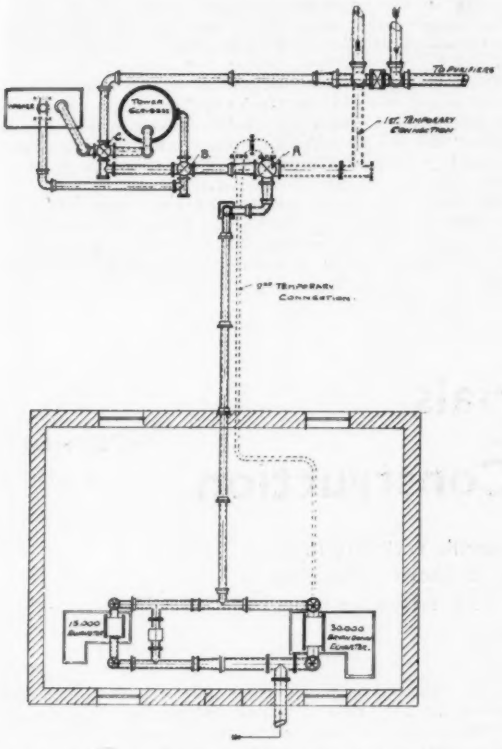


Fig. 1.—Plan of 8 in. Connections to Exhausters and Washing Plant before the Alterations.

should we be tied for time, and if any unforeseen delay did occur it would not affect the gas making in any way.

One disadvantage, of course, was that while one section was by-passed, other sections of the plant would be called upon to cope with the extra work—for instance, during the first operation the Holmes washer scrubber had to deal with the whole of the gas made, but as this particular portion of the work was completed between 11 a.m. and 6 p.m., no serious trouble was experienced.

Before commencing the work a schedule was drawn up in order that the various operations should be carried out in their proper sequence. This was most important, as much depended on doing each portion of the alterations in its correct order to ensure that there should be no stoppage of the gas supply.

The first operation was the insertion of a temporary by-pass between the rotary valve A and the inlet of the Holmes washer scrubber, the connection being made above the inlet valve, while the washer scrubber was by-passed, the inlet and outlet valves being closed.

The outlet valve of the washer scrubber was then opened, the by-pass valve closed, and the rotary valve A turned round to the position shown by the dotted lines (the operations being carried out simultaneously); the gas was thus made to pass direct to the washer scrubber and the rest of the washing plant was shut off.

The old line of main between the rotary valve C and the inlet of the Holmes washer scrubber was then removed and the new line of 12 in. main consisting of the new outlet and by-pass valves to the Cockey's washer and the scrubber inlet, outlet, and by-pass valves was inserted, temporary connections being made between the new by-pass valve of the Cockey's washer and the outlet of the rotary valve C. When completed, the rotary valve A was turned back to its original position, the Holmes washer scrubber by-pass opened, and the outlet closed, and the gas passed through the Cockey's washer and tower scrubber as usual, the Holmes washer scrubber being off.

The cutting out of the old main was commenced about 11 a.m., and the gas was turned in at 6.0 p.m. Some little trouble with leakage was experienced at the connection between the old 8 in. and the new 12 in. at the rotary valve C due to the levels of the new not corresponding with the old, and also the fact that a very short 12 ft. x 8 ft. taper piece had to be employed; but as this was only of a temporary nature the joint was bandaged with white lead and hessian, and it remained tight in this condition until disconnected and the proper joints were made.

The following day the temporary connection between rotary valve A and the washer scrubber was dismantled and the inlet reconnected and the washer scrubber again put to work.

From this point until the completion of the whole job it was possible to use two of the three pieces of washing plant, and as the whole of the work was carried out during the summer, the period of least demand for gas, no trouble was experienced from tar or ammonia being carried forward to the purifiers.

The next operation consisted of by-passing the Cockey's washer by turning rotary valves B and C to positions shown by dotted lines, disconnecting the old 8 in. main, and inserting the new outlet pipes, these being connected on the opposite side to the old one.

The old 8 in. inlet pipe to the washer was next dismantled, the new 12 in. inlet with its valve and tee for by-pass being connected to the new 12 in. main from the exhauster house, which had previously been laid dead, together with the new seal pit, in entirely new positions.

In the exhauster house the Bryan Donkin 40,000 cu.ft. per hour exhauster had been installed and the outlet connected to the above main, a 12 in. tee being left to pick up the new 12 in. connections from the existing 30,000 cu.ft. Bryan Donkin exhausting set.

The inlet to the new exhauster had not been connected, as the 15,000 cu.ft. 3-bladed Waller exhauster was still acting as a stand-by and the old 8 in. main to and from this exhauster had to be removed before the 12 in. connections could be put in place.

Our next problem, therefore, was the dismantling of the Waller exhauster, the removal of the 8 in. mains on its inlet and outlet, and the 8 in. outlet mains from the existing Bryan Donkin exhauster, substituting for these mains the new 12 in. inlets and outlets.

The whole of this work was again carried out with perfect safety by the use of a temporary by-pass in the following manner: The old Bryan Donkin exhauster, which up to this point had been at work, was shut off, and the small Waller exhauster put to work, the inspection cap on the side of the outlet valve of the Bryan Donkin exhauster

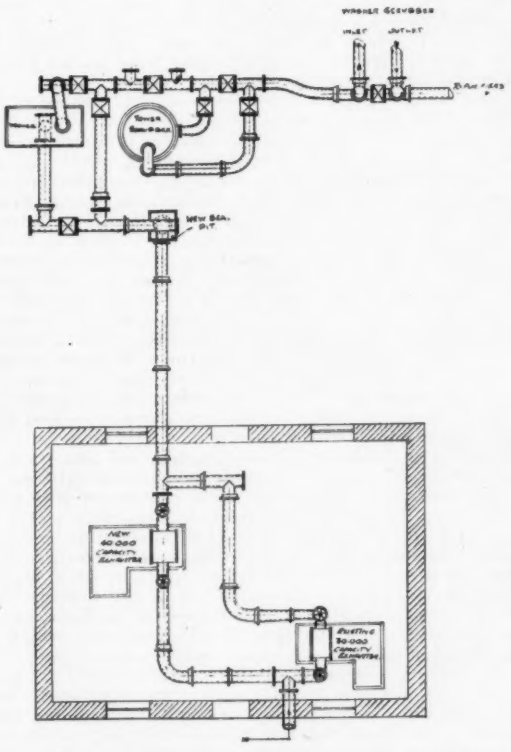


Fig. 2.—Plan of 12 in. Connections to Exhausters and Washing Plant after the Alterations.

was removed, and a special flange spigot piece bolted in its place. A 6 in. cast-iron main with Stanton Wilson joints was carried above ground from this point through the door of the exhauster house, and connected with suitable taper pieces and bends to the open socket on the

rotary valve A (temporary by-pass shown in dotted lines), the other open socket was then plugged and caulked with lead wool.

The exhauster was again put to work and the Waller exhauster shut down, the gas travelling via the existing 8 in. outlet main to the scrubber, &c. The gas had, of course, filled the temporary by-pass, but could get no further than the rotary valve A.

We next closed the exhauster outlet valve and turned the rotary valve A simultaneously into the position shown by the dotted lines, shutting off the whole of the 8 in. outlet mains in the exhauster house and causing the gas to travel via the temporary 6 in. by-pass to the scrubber and so on to the washer scrubber and purifiers.

The old 8 in. outlet mains from both exhausters were removed and the new 12 in. put in their place, connecting up with the 12 in. tee on the outlet of the new Bryan Donkin exhauster. The outlet valve from this exhauster was closed, the outlet of the old Bryan Donkin exhauster opened, the rotary valve A turned back again, and the gas then travelled through the new 12 in. mains to the washer through the new outlet, and so on to the Holmes washer scrubber, leaving the whole of the old connections to the scrubber, including the three rotary valves, shut off and to be dismantled at our leisure.

The inlet connection to the Waller exhauster was next bagged off by reducing the pull to level gauge and inserting the bag in the existing portion of the 12 in. main, the 8 in. connections were taken out, the Waller exhauster was removed, and the new 12 in. inlet to the new exhauster was fixed.

When this had been completed the new exhauster was put to work, the old one shut off, the temporary 6 in. cast-iron main dismantled by simply unscrewing the locking rings of the Stanton-Wilson joints, and the inspection cap replaced. Both exhausters were then completed and either could be used as desired.

All that then remained to complete the job were the new connections to the scrubber. This was a simple matter and consisted of removing the old mains and connecting the new 12 in. to the new inlet and outlet valves already fixed.

The Application of Materials To Gas-Works Construction

by
H. JOHNSTON,
of Bradford.

From a Paper read before members of the Yorkshire Junior Gas Association at a meeting held at Bradford on Saturday, April 24—the PRESIDENT (Mr. E. R. B. French, of Leeds) in the chair.

The advances which have been made in comparatively recent years in the production of new materials, metallic and non-metallic, are exceptionally great. A relatively short time ago the ferrous metals used for construction, or, at any rate, met with on the gas-works, were limited to wrought iron, cast iron, and simple carbon steels, containing only small quantities of foreign elements. To-day there are available ferrous and non-ferrous metals and alloys which offer an extraordinary diversity of physical and mechanical properties.

As an instance, consider chromium steels, which by heat treatment give combinations of stainlessness, resistance to corrosion, and resistance to oxidation, at temperatures considerably above normal. Plain chromium steel—*i.e.*, mild steel with the addition of chromium in controlled quantity—can be hardened, tempered, welded, soldered, brazed, etched, drawn, ground, and polished. By the addition of small quantities of non-metallic elements, such as carbon, boron, and silicon, the properties of iron are profoundly affected. Steels are available of extreme hardness and of high tensile strength. Of the non-ferrous metals, there are alloys of copper, nickel, and other metals, which are highly resistant to the action of corrosive agents, and have the strength, toughness, and ductility of steel; some of these can be wrought, cast, and machined as easily as brass, and have a useful field of application where ordinary metals have been found unsuitable. New uses and applications have been found for copper and zinc.

It is now possible by an electro-chemical process to deposit metal on metal in varying thicknesses without distortion, and with a degree of adhesion which will permit machining. By this process mild steel or other metals can be given a surface deposit of nickel, chromium, cadmium, copper, and lead, thus giving to the metal a surface of extreme hardness, low coefficient of friction, or a high resistance to corrosion. The adhesion of the deposit to the body metal is such that it is not possible to dissociate one from the other. Of the non-metallic materials which find a useful purpose to serve in gas-works construction, there can be instanced cement, to which improvements in manufacture and conformity of quality are constantly being made, and for which new uses are continually being found. Diatomaceous earth for the manufacture of materials for insulation and the conservation of heat; new uses for vulcanized fibre, asbestos, porcelain, and india-rubber; the manufacture of iron sheeting with a vitreous enamel surface—these are all valuable material developments.

Renewals and maintenance costs account for a big proportion of the yearly expenditure of any gas undertaking, and while it is obvious that this item could never be eradicated, it is evident that with wise selection of materials which constitute vital parts of our plant, and with an understanding of the peculiar conditions under which they have to work, it is possible to reduce expenses under this heading, at any rate to some extent, and in many cases simultaneously increase operating efficiency. In some cases it may mean increased initial expenditure, but what matter if it is more than compensated for by reduced annual maintenance costs.

It is usually part of a gas engineer's duty to prepare specifications for the supply of materials or for the execution of engineering contracts, and much depends on the way this is done, especially so to-day when much new plant is being installed and when competition compels us to buy and contract not loosely, but with a fine knowledge of what we want and what we know will serve us best in the specific duties of performance and life.

Structural Work.

In recent years a high tensile steel for structural purposes has been developed, users of which are covered for quality by B.S.S. No. 548/1934. This steel has been accepted by official bodies representing the users and has a 50% increase in the working stress over ordinary 28/33 tons mild steel. It has an ultimate tensile stress of 37 to 43 tons per square inch, with an elongation of 18% $\frac{3}{4}$ in. thick and upwards, with a yield point of 23 tons per square inch. High tensile steel of rivet quality is covered by the same B.S.S. and has a tensile stress of 30 to 35 tons per square inch. The high tensile strength and quality of shock resistance is effected by alloying with plain carbon steel, chromium, copper, and silicon or other elements. This result is partly due to direct action and partly to greater benefits of the quenching and tempering treatment.

High tensile steel can be supplied in the usual standard sections. The higher strength allows for lighter sections for the same loads, or heavier loads with the same section. The chromium and copper content also increase the rust resisting properties of the steel, which is necessary if the full advantage of being able to use lighter sections is to be maintained. The corrosion resisting properties are two to three times greater than ordinary plain carbon 28/33 tons steel under similar conditions.

The advantages gained are at the expense of higher price per ton, and though it is claimed that the steel machines readily at all speeds and feeds used for mild steel, and that it can be punched and drilled on the same tools, I doubt whether it is as free cutting and as readily machined. The steel is ductile and flanges satisfactorily, and is suitable for welding. Its physical properties result in reduction of fabricating costs, possibly excavations and foundations, constructional, and transport expenses. Gas-works have in many cases reduced the cost of massive stone or brick retort houses, purifier houses, machinery houses, &c., by the substitution of light steel skeleton structures

with 4½ in. brick panels and facings, while works plant and machinery are built on super-structures of steel.

While I cannot see the possibility of much advantage of alloy steels in the case of small sections, its use for larger sections will, in many cases, result in further economies combined with permanence, and is, therefore, worthy of consideration.

Coke Hoppers and Chutes.

Coke is highly abrasive and in the presence of water corrosive, and in storage is occasionally accompanied by combustion and heat. Hoppers for storage of coke should be resistant to these influences if long life and low maintenance costs are to be obtained. Hoppers are often formed of mild steel plates, perhaps because they are light in weight, easily constructed, adaptable, and low in first cost, but being so low in resistance to the destructive properties of coke occasion high maintenance costs unless suitably protected.

The greatest action occurs where there is the most weight and contact, such as the hopper cone plates or the chute bottom. Long life protection may be obtained here by a lining of, say, 6 in. square blue brick tiles ⅞ in. thick and set in cement, any tendency of the lining to slide being checked by an angle stop at the bottom. They have long life, and it is not often that the supporting structure will not carry the additional weight. Old firebrick tiles or bricks are excellent too, provided the additional weight can be carried. A new material, of which I have had no experience, but which appears to be suitable for this purpose, is basalt rock of extreme hardness and durability, cast in the form of tiles.

Sheet vulcanized rubber about ¼ in. thick is another material useful for hopper and chute linings, but only where there is no possibility of fire, and where the angle of slope is sufficiently steep to permit free movement of coke. In Bradford this material is used for lining certain sloping sections of the C.W.G. coke storage hopper and chute. Published tests of sample strips of mild steel and rubber subjected to identical sand blast action proved that the volume of material worn away was in the proportion of: Mild steel, 1·5; vulcanized rubber, 1·0.

It is sometimes desirable to line the vertical sides of steel hoppers, and here a difficulty is met with tiles because they are liable to loosen and fall. I have used concrete for the vertical sides of producer feed hoppers, first cleaning the plates and afterwards fixing a metal former secured by round ¼ in. mild steel bars and hook bolts with distance pieces at a distance of 1 in. from the inside face of the plating, trowelling a fine cement sand concrete on the working face to a depth of about ¾ in., and pressing well into the open to obtain a good key and finally grouting in the remaining space between the former and the plate. Probably due to deficiency in concrete quality, or inexperience in application, the lining after some months commenced to break away at the bottom where the shock of falling coke directly on to the lining was greatest. A better concrete lining to vertical hopper sides of steel could be obtained by a process in which cement sand concrete is applied through nozzles under pressure, directly on the steel, obtaining the necessary key by steel mesh. A denser, tougher lining may be obtained in this way.

Coke hoppers which have their own supporting structure are often constructed entirely in reinforced concrete. For this purpose the concrete should be hard and dense and made with good materials. In order to obtain denseness a vibratory method is sometimes used. A machine is clamped to the timber forming a shuttering, which transmits vibratory motion to the temporary structure, and the wet concrete mix is literally shaken into close mass. This method has the advantage of obtaining very dense concrete, most intimate contact with the reinforcement, and with the use of little water in the mix—a 1 in. to 1½ in. slump is all that is required. Care should be taken to obtain good cover of reinforcement with concrete, say, 1½ in., in order that there be small likelihood of concrete being shipped off and laying bare the reinforcement. Concrete hoppers have the disadvantage of spalling and surface disintegration in the case of fire in the coke. As a preventive a lining of refractory concrete may be given. The main feature of this material is that in addition to possessing properties of ordinary alumina cement concrete, it has qualities of refractoriness and low conductivity, is rapid hardening, and resistant to corrosion. It requires no pre-firing, is stable under load up to 1,300° C., and can be subjected to the widest sudden fluctuations of temperature without spalling.

I have had experience of designing and building coke hoppers of steel joist framework with 4½ in. firebrick filling. The sides of the hopper are framed, strutted and braced in 6 in. by 4½ in. R.S. joists and 6 in. by 3 in. channels, and designed as a girder over the supports to carry the load, while the panels on sides and ends are filled in with 4½ in. firebrick with cement joints. The inside face of the steelwork is protected from contact with the coke by cement rendering over a wire mesh bond. The flat bottom may be plated and bricklined, or of concrete with framing to form the discharge openings and support the gear. This type of hopper is comparatively cheap, especially so when old fire-bricks are available for use, while it is practically free from maintenance costs.

Conveyor buckets handling coke are subjected to abrasion and corrosion. When holed they may be patched simply by tack-welding a roughly cut plate cover and the life increased considerably. We have recently bought a consignment of buckets made of ⅜ in. copper bearing steel plate (copper content 0·3 to 0·35%) to resist wear and corrosion at a price slightly more than ordinary mild steel. We had not any previous experience with this comparatively new alloy, and the actual life remains to be seen. However, the results of tests are all in favour of copper bearing steel.

General Machinery.

A low carbon high chromium steel, which is ductile and easy to manipulate, is covered by B.S.S./S61-35/45 tons per square inch ultimate tensile strength, with an elongation of 25%, Brinell Hardness 152-207, and containing 0·15% maximum carbon, 1·0% minimum nickel, 12% minimum chromium, 0·5% maximum silicon. It is suitable for turbine blading and shrouding, tanks where resistance to corrosion is required, and would be suitable for condenser tubes when a corrosive water is employed for cooling.

A stainless steel which will find many useful purposes in gas-works mechanical plant is covered by B.S.S./S62. It has an ultimate tensile strength of 46/62 tons per square inch, elongation 20%, Brinell Hardness 207-235; it contains carbon 0·5/0·35%, nickel 1%, chromium 12%, silicon 0·5%. When hardened it is suitable for parts subjected to wear and abrasion, which can be machined and ground to size. It is particularly useful for general engineering purposes, and I have used it for pump rods and clack valves and seats, piston rods, and have specified it with excellent results for steam and hydraulic valves, valve seats, and spindles.

B.S.S./S80 calls for a stainless steel of 55 tons per square inch minimum tensile strength, Brinell Hardness 241, 16/20 chromium. It is of higher corrosion resistance than B.S.S./S62, and has higher tensile strength coupled with toughness and ductility.

Stainless steels are manufactured to resist high temperatures up to 1,100° C. without appreciable scaling, and are useful for such purposes as furnace equipment, pyrometer sheaths, and bucket conveyor filler drums.

On a number of occasions I have had experience and evidence of the usefulness of electro-chemical deposition of metal on metal. The metals ordinarily deposited are nickel, chromium, cadmium, copper, and lead. The adhesion of the deposited metal to the base metal is obtained electro-chemically, and the blending is such that it is not possible to dissociate one from the other, either by bending or twisting. A deposit of any required thickness can be applied, and the deposit can be machined and ground. There are various methods of restoring worn parts to their original dimension, such as welding in the case of ferrous metals, or brazing in the case of non-ferrous metals. Owing to the high temperature necessary, there is a danger of heat distortion and also of altering the characteristics of the metals themselves, the finished surface is of a variable nature and not uniform in texture, and while building up worn parts by welding is most useful in many cases, for others it is not suitable. With the deposition process, worn parts can be built up without heat and unaccompanied by distortion, and finally given a perfect ground finish and with a surface much superior in quality to the base metal of the part. I have experienced the application of this process in the following instances:

(*a*) A mild steel shaft of a waste-heat boiler fan, steam turbine, occasioned considerable wear with frequent shut downs and renewals of carbon gland rings. The shaft was dismantled, skimmed down in the lathe, given a deposit of nickel, and re-ground to original size. The trouble has not since recurred in five years.

(*b*) Various pumps and engines had parts renewed in stainless steel, but in the case of rods above approximately 2 ft. long by 1 in. diameter, it was found cheaper and quite as efficient to use the old scored rods by machining in the lathe, and then having nickel or nickel chromium deposited, and finally grinding to size. For ordinary circumstances a nickel deposit was found satisfactory, but in other cases when trouble was experienced with coke grit the rods were first built up with nickel and finally given a deposit of chromium a few thousandths of an inch thick and ground to size. It is to be noted that

nickel deposit is cheaper than chromium. A chromium finish gives a surface hardness of over 1,000 Brinell, being practically free from wear and highly corrosion resisting. It will give a long life to such parts as mentioned.

(c) The bearings in a coke buggy runway turntable were being regularly renewed every six months. Bushes which had been given a chromium deposit were fitted, and when taken out for inspection after eighteen month were as new, and did not show even a scratch.

As a means of salving worn or corroded moving parts and giving a new intensely hard and non-corrodible surface, the process is very attractive. The nature of the process also provides a method of protection for new parts against corrosion and wear by deposition of selected metals to give enhanced value and longer life.

Discussion.

The PRESIDENT (Mr. E. R. B. French, Leeds) said the Paper was of the utmost importance to every undertaking. Both on the works and the distribution side, there were materials in use to-day which undoubtedly had been greatly improved by the various processes which Mr. Johnston had so well explained to them. They must feel deeply obliged to Mr. Johnston for having expended on their behalf such a great deal of time as must have been involved in the preparation of this Address.

Mr. G. E. CURRIER (Bradford) congratulated Mr. Johnston on his Paper in which he had displayed again the conspicuous ability which marked everything that he undertook. In tackling the subject rather from the manufacturing side than the utilization side he had broken new ground. He did not remember that there had been any Paper on the subject of materials before the Yorkshire Juniors in recent years, and this Paper was a rich mine of information which would be most useful as a work of reference. The question of materials was becoming more and more important. It was not sufficient to say that such and such a material would meet their requirements, because it was increasingly urgent to keep their costs down to a minimum. They had to be in a position to say that they had got the right materials after taking everything into consideration, and until they had explored all the materials available they could not say that they had examined the position as fully as they ought to do. The field of materials for such a Paper was an enormous one and involved enormous work. During the last two or three years the subject had become more important in Bradford than in normal times because they had embarked upon a construction and centralization scheme on the manufacturing side by which they were involved in a capital expenditure in the region of £200,000. In this scheme there were 30 main contracts and they were carrying out a lot of work by direct labour and must prepare between thirty and forty specifications, and, therefore, consideration of the question of materials had taken up an enormous amount of time. Apart from this scheme they had still found a little time to do experimental work in order to find the most suitable material for the saving of maintenance costs. In regard to specifications they in Bradford had found being a subscriber to the British Standards Institution of considerable help. They kept a special section in the Gas Department's library for these specifications and they were open to the inspection of any member of the staff.

The subsequent speakers who raised a number of points of detail arising out of the Paper were Messrs. C. A. NEWHAM (Leeds), A. W. ELLIOTT (Elland), J. RICHMOND (York), J. A. DERBYSHIRE (Shipley), J. HUBBARD (Leeds), and V. J. J. SIDDONS (Barnsley), and in each case Mr. JOHNSTON replied in detail.

Vote of Thanks.

A vote of thanks to Mr. Johnston was proposed by Mr. A. H. CLUCAS (Leeds).

Mr. A. W. ELLIOTT (Elland), in seconding the vote of thanks, said that in consequence of the continual research concerning materials engineers were spending far more comfortable hours now than used to be possible to them.

Mr. JOHNSTON suitably replied.

Centenary of C. & W. Walker, Ltd.

Mr. R. J. Milbourne on the Coal Position

Attention was drawn by Mr. R. J. Milbourne, Chairman of Messrs. C. & W. Walker, Ltd., when he addressed the shareholders at the Annual General Meeting last Wednesday, to the fact that the Company this year celebrates its centenary. The record of their Company, Mr. Milbourne observed, was evidence of the wise policy inaugurated by its founder, Charles Walker, who commenced a small engineering works in Clerkenwell, London, in 1837; that policy was being continued by the present Directors. They did not, however, intend to rest upon past achievements, but to be as progressive and vigorous as ever in the previous history of the Company, and they would continue to take full advantage of the various opportunities which presented themselves to business enterprise.

On the coal position Mr. Milbourne pointed out that, as the Gas Industry used over 18 million tons of coal annually, it not only viewed with concern the increasing prices demanded for its raw material of manufacture, but also the manner in which the coalowners were interpreting the powers recently given to them under the Coal Mines Act of 1930 and the various statutory schemes for the marketing of coal. These powers not only gave to the mine owners full liberty to fix the price of all coal sold, but also to dictate the source from which the supply had to be obtained. Such a course of action might be of small moment to the domestic consumer, but it was a matter of vital importance to the Gas Industry and public utilities generally. Most of the gas-works throughout the land had found from research and past experience the class of coal most suitable for their special requirements, and it was earnestly to be hoped that the Committees which were being set up to watch the interests of the coal users would be able to obtain redress in all instances of real and proved grievances. If the prices of coal were to be still further advanced beyond the voluntary increase of one shilling per ton, it would mean that practically all utility undertakings would be forced to pass the increase on to their consumers.

The position of the miners in some of the coal mining areas needed some revision in order to improve their domestic conditions, yet this state of affairs did not apply to many of the coalfields where living conditions and wages were such as might fairly be considered satisfactory. Whatever schemes of re-organization in the coal industry were eventually adopted, care had to be taken to ensure that an adequate supply of suitable gas-producing coal was provided for the Gas Industry and other utility undertakings at an economic and reasonable price.

The annual report for the year ended Jan. 31, 1937, stated the balance brought forward from the last account was £1,631, to which had been added the profit for the year's trading amounting to £30,835, giving a total available of £32,466, which the Directors proposed should be dealt with as follows: In payment of a dividend on preference shares of 7½% per annum (less tax) paid on April 5, £3,000; in payment of a dividend on ordinary shares of 10% per annum (less tax) payable on April 30, £9,530; in payment of a bonus on ordinary shares of 1s. 6d. per share (less tax) payable on April 30, £7,147; and to transfer to general reserve £7,500, leaving a balance to carry forward of £5,289.

Gas Street Lighting for Great Torrington

Seven Years' Contract Secured from Electricity

A seven years' contract for the lighting of the Borough of Great Torrington has been secured by the Bideford Gas and Coke Company, Ltd.

This contract had previously been held for a period of five years by the local electrical supply undertaking, at the expiration of which tenders were called for. These were practically identical in price, and it was decided to ask both companies to fit up specimen lights for inspection by the Mayor and Council of the Borough.

This was duly carried out, and, after an inspection of the two sources of lighting, it was decided to accept the tender of the Gas Company for the seven-year period.

Scottish Eastern Juniors

Visit to Bruce, Peebles, & Co., Ltd.

For the last visit of the Session members of the Scottish Junior Gas Association (Eastern District) inspected the works of the world-famous firm of Bruce, Peebles, & Co., Ltd., Edinburgh, on April 10, and spent a profitable afternoon among their modern plant which is concentrated on the manufacture of rotating electrical machinery, transformers, and mercury arc rectifiers. It is interesting to note that this firm came into being as the electrical department of Peebles & Co., Ltd., Edinburgh, so well known in the Gas Industry. This took place in 1898.

At the conclusion of the visit the members were entertained at tea in the works canteen where they were welcomed by Mr. Crawley, Chief Engineer. Mr. J. M. Dow (Kirkcaldy), President, thanked Messrs. Bruce, Peebles, for their kindness in allowing the party to visit the works, and the guides for the excellent way in which they had contributed to the interest of the visit.

Colombo Gas and Water Company, Ltd.

The Annual General Meeting of the Shareholders of the Colombo Gas and Water Company was held at the Company's Offices, 148, Gresham House, Old Broad Street, E.C. 2, on Tuesday, April 20, 1937—Mr. ROBERT H. GLEN, F.C.A. (Chairman), presiding.

The SECRETARY (Mr. S. F. Field) read the notice convening the Meeting and the Auditor's Report.

The CHAIRMAN: Gentlemen, a copy of the report and statement of accounts having been sent to all the members, I will ask you to take them as read.

At our last General Meeting held on April 20, 1936, I remarked as to signs of a general trade recovery in the Island of Ceylon and I am glad to report to you that improved conditions prevailed throughout the year under review, the revenue from such exports as tea, rubber, and coconut produce being all more than in the previous year. Further, it would appear that the current year will show even better figures than those recorded for the year ended Dec. 31 last.

Turning now to the accounts as before the Meeting, I will briefly refer to the item for additions to capital, which this year amounts to £1,563 0s. 1d. This is mostly for the cost of a new motor lorry, supplying and erecting an enamelling plant for the reconditioning of our cooking and other appliances, and the cost of a new showroom. I will, however, deal more fully with these items a little later.

The total quantity of gas sold during the year was 250,851,200 cu.ft., or 13,681,400 cu.ft. less than the previous year. You may remember that I referred at our last Meeting to the conversion of a number of our gas public lamps to electricity. This conversion continued during 1936, and by the end of the year a total of 982 lamps had been so converted. The amount of gas sold to consumers, other than for public lighting, showed an increase of 3½ million cu.ft., which your Directors consider is satisfactory.

Coal carbonized was slightly less than previously, the figures being 16,070 tons during 1936, as compared with 16,900 tons during 1935. The gas made per ton of coal carbonized was approximately the same. The gas unaccounted for was 6·57% as against 5·68%.

Working expenses are Rs. 16,261 lower, but wages for fitting work show a slight increase of Rs. 948. Legal expenses at Rs. 505 is approximately the same as last year and bad debts account, I am pleased to say, amounts to only Rs. 941. The cost of passages was Rs. 4,025, as compared with Rs. 5,785 for the preceding year. Depreciation of stock and motor vehicles was about the same as for year 1935, the respective figures being Rs. 53,299 and Rs. 55,625.

The cost of fixing cookers and geysers was slightly more. During the year 50 additional cookers and 147 additional geysers and "Califonts" were fixed, making as at Dec. 31 last a total of 2,163 cookers and 1,788 geyers and "Califonts" out in the town.

Maintenance of cookers shows an increase of Rs. 6,500, which is entirely due to the cost of renovating old cooking and heating appliances. The Directors considered it advisable to put down an incinerating oven and an enamelling oven with a spraying booth for the purpose of spray enamelling these gas appliances. The plant has been in operation since May last, and I am pleased to report it is found a great success. The finished stove with nickel plated taps enables us readily to place such cookers on the district.

With regard to the cost of showrooms, which is Rs. 4,054 higher than shown in the 1935 accounts, the Company have, for some time past, been trying to obtain suitable premises in the Fort area. The opportunity came during the year, and I am glad to say we were able to lease suitable space at a reasonable cost. The premises, which were opened on Nov. 10 last, effectively display a wide range of modern gas appliances and have been much admired. The additional cost is for the upkeep of these premises. At a later date it is hoped that gas cooking demonstrations will be given further to popularize gas.

Bonus to staff and workmen cost Rs. 23,534, which figure is about the same as in the preceding year. Ceylon income-tax amounts to Rs. 12,565; this figure is Rs. 4,801 less than for year 1935, the rate of such tax having been reduced from 12 to 10%. As you are aware, Dominion income-tax relief is claimed in London, and the proportionate relief from tax on dividends is made to our shareholders.

Gas rentals on the credit side of the revenue shows a decrease of Rs. 19,359, the lesser gas sold for public lighting accounting for this. Meter rentals at Rs. 24,442 is about the same as for the previous year.

The revenue from the sale of residual products, &c., amounted to Rs. 165,149, or only Rs. 2,319 less than for year 1935. The average price obtained from the sale of coke and tar was about the same as in the previous year, but the quantity of coke sold was less by 847 tons, the lesser quantity of coal carbonized partly explains this. I am pleased to say the demand for our residuals continues and is very satisfactory.

Although the Rupee profit as shown for the year at Rs. 161,539 is slightly less than for the previous year, your Directors feel sure that, in view of the additional expenses incurred during 1936 for upkeep of our new showroom and cost of working the enamelling plant, &c., the result of the year's working, will be considered good.

There does not appear to be any item in the London revenue account calling for particular mention, so I will now deal with the general balance-sheet. There is no change in the reserve account, which stands at the satisfactory figure of £76,764. During the year a further sum of £2,000 was invested in gilt-edge securities making the total cost value of our investments £44,910. I need hardly say that the market value as at Dec. 31 was considerably higher than the figure shown in the accounts. These are I think all the comments I need make on the accounts.

The balance of net revenue is £21,137 2s. 7d., and the Directors recommend a final dividend of 3½% on the preference shares and a final dividend on the ordinary shares of 5%, both less tax, making 7% on the preference shares and 10% on the ordinary shares for the year ended Dec. 31, 1936.

Several important gas installations, including the fixing of cooking and heating apparatus at the Chief Secretary's office and laboratory fittings at the Bacteriological Institute, have been carried out during the year, with the result that our fittings department has been kept very busy. A further valued order has been secured for the fitting up of a new block of flats in Colombo, which, when completed, will be equipped with 32 cookers and 84 geysers and water heaters, all of which appliances are being purchased outright from this Company.

I should like to refer here to the services rendered, over a number of years, by our Engineer and General Manager, Mr. S. Barker Johnson, who retired from the Company on March 31 last and who is now on his way home. Mr. Johnson has served the Company well, and I feel I shall be voicing the shareholders' as well as the Directors' views by here thanking him for his keen and loyal service and also wishing him a long and peaceful retirement. Mr. Harold E. Stone, who has had considerable gas-works experience, has been appointed Engineer and General Manager, and he will have with him Mr. Leslie F. Nicholson, late Engineer of the Kowloon Works of the Hong Kong and China Gas Company, Ltd., as Resident Engineer and Manager.

I now have pleasure in moving that the report and accounts be received and adopted.

Mr. ALEX. A. JOHNSTON seconded the resolution, which was carried unanimously.

The CHAIRMAN proposed:

> "That a dividend for the year ended Dec. 31, 1936, at the rate of 7% per annum upon the preference shares, less income-tax, and 10% per annum upon the ordinary shares, less income-tax (both less interim dividend paid Oct. 23, 1936), be and is hereby declared, the warrants to be payable on April 23, 1937."

This was seconded by Major HERIOT R. GLEN and unanimously carried.

The re-election of Major Heriot R. Glen as a Director was proposed by the CHAIRMAN, who said Major Glen was a very keen and valuable Director. He worked hard for the Company and his time and interests were always at its disposal. Brig.-Gen. GOLAND V. CLARKE seconded the resolution and, in endorsing the proposer's remarks, added that Major Glen was an able and pleasant colleague on the Board.

The resolution was carried unanimously and Major GLEN thanked the meeting, assuring them of his best efforts.

Mr. S. J. TUNGAY proposed that Mr. William Cash, Jnr., M.A., F.C.A., be re-elected as Auditor for the ensuing year at a fee of ninety guineas. Mr. A. E. HAYES seconded, and the proposal was carried unanimously.

The CHAIRMAN then proposed a vote of thanks to the staff, abroad and in London. He said the accounts showed the Company had a good staff. As a colonial Company, they were very much in the hands of the staff abroad, but they all worked hard in Colombo, which could be a very trying place. In London, they had Mr. Field as Secretary. He worked hard and was very ably seconded by his small but energetic staff. He did not think he knew any London Office of a colonial Company which was better served.

Mr. T. W. WELSH seconded the resolution, which was carried unanimously; and the Secretary briefly responded.

Mr. A. E. HAYES proposed a vote of thanks to the Chairman and Directors, which was seconded by Mr. S. J. TUNGAY and unanimously carried.

The proceedings then terminated.

Trade Notes

Morse Chain Company, Ltd.

We have received from the Morse Chain Company, Ltd., Letchworth, Herts., a copy of their publication dealing with standard chain drives.

Foster & Pullen, Ltd., New Literature.

The "Laundress" washer, the "Showray" burner for interior lighting of shop windows, offices, &c., and the "Super" floodlight unit are dealt with in literature we have recently received from Messrs. Foster & Pullen, Ltd., Avil Works, Crossley Hall, Bradford.

Many advantages are claimed for the "Laundress," among which are the light operation handle for the 16 in. roller which is guaranteed for five years, corrugated aluminium agitator creating best and harmless swill in corrugated square boiling pan, and strong stove-enamelled casing in blue mottle protected from burner heat by baffle plate.

The "Showray" lighting unit is provided with red, white, blue, green, and amber colour filters, which may be used as desired. A colour display by gas light should make displays infinitely more attractive. The "Super" floodlight unit has a substantial tinned steel case, superheater burner with exterior adjustment, and is glazed with heat-resisting glass.

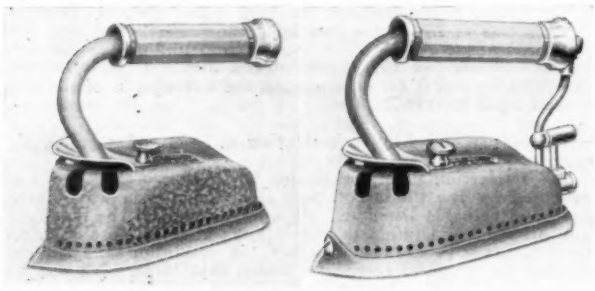
A Firm of Continual Development.

Fry's Metal Foundries, Ltd., Tandem Works, Merton Abbey, S.W. 19, celebrate their Silver Jubilee this year. The Company was founded in 1912 by Mr. John Fry, son of Mr. Thomas Fry, whose association with the production of lead base alloys dated back to 1850. The history of the firm is one of constant development. In 1932 the offices and works were transferred from Blackfriars, S.E., to Merton Abbey; new shops were built for the Associated Company, Fry's Diecastings, Ltd., and the combined works cover an area of five acres. Branch foundries have been opened in Manchester, Bristol, Glasgow, and Dublin in order to give prompt service and personal attention to customers all over the country. A foundry in Calcutta serves an important Indian market.

The Tandem Works are now one of the largest and best equipped works in Europe for the production of tin-base and lead-base alloys. Much research work has been done in recent years to determine the most economical grade of solder for each class of work. Some striking results have also been obtained through research into the quality of solder. It has been found that certain impurities are harmful even in the minute proportion of 0·001%—an amount which cannot be detected by normal analytical methods. There is rigid control of quality through all stages, from the smelting of the raw material, through the complicated refining operations, to the final alloying and casting of the solder sticks. Every batch of metal is checked by analysis through every stage.

"Keith" Domestic Gas Irons.

We have received from Messrs. James Keith & Blackman Co., Ltd., 27, Farringdon Avenue, E.C. 4, a copy of their literature dealing with "Keith" domestic gas irons for use with gas at normal pressure.



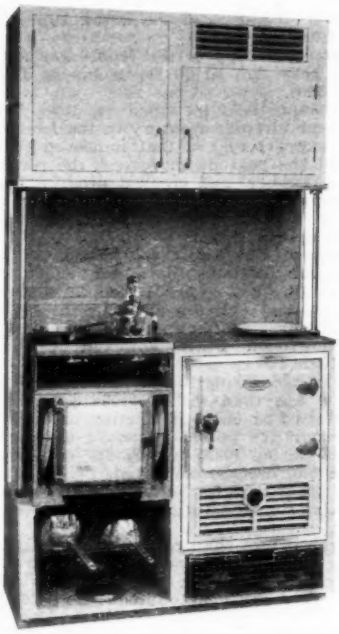
"Keith" Domestic Gas Irons. *Left*, Standard, and *right*, Thermostatically-Controlled, Models.

In the "Keith" iron the burner is integral with the sole; it can be lighted quickly without "lighting-back." The products of combustion are discharged at the sides and front under a deflecting hood in such a way as to clear the hand and wrist of the operator. The average consumption of the "Keith" gas iron is about 3 cu.ft. per hour at the ordinary 3 in. pressure, so that it can be used at a cost of one penny for about seven hours. The handle of the iron has been utilized as the injector proper, and one advantage secured by this use of the handle is that the passage of the air and gas mixture through the injector keeps the handle cool. It is claimed the injector is also more efficient by its comparative insulation from the base.

The thermostatically-controlled model is fitted with a blue enamel cover and finished in chromium plate. The thermostat adjusts the gas consumption to suit the demand, the temperature being controlled by a screw at the nose of the iron. The weight of the thermostatically-controlled iron is about the same as that of the standard—viz., 5½ lb. The stand for these irons is made of pressed steel with a spiral insulator which prevents scorching of the ironing board.

"Kandya" Built-In Fitments.

With the introduction of the small house and modern living apartment, it has become necessary to regard the kitchen as the centre around which the general living accommodation is planned. With this object in view, "Kandya" built-in fitments have been developed in design and construction to supply the needs of the housewife. These units are so planned that they can be built in side by side, disregarding entirely any irregular wall space.



A neat kitchen cabinet combination incorporating an "Elf" gas cooker and "Electrolux" gas-operated L I. model refrigerator.

The most recent combined unit is the outcome of a number of experiments made in collaboration with Electrolux, Ltd., and Messrs. Sidney Flavel & Co., Ltd. This unit is 6 ft. 9 in. high, 3 ft. 7 in. wide, and 1 ft. 9 in. deep. It is constructed with American whitewood front framing, Oregon pine ply sides and back. It is fully insulated with asbestos and due care has been taken to ensure that all heat is suitably dealt with. The hot air from the refrigerator is passed through a flue at the back of the cabinet and out of a ventilator at the top. Above the working surface there are two large cupboards for dry goods, while at the base a vegetable basket is provided.

The exterior fittings are chromium-plated on brass, and when finished in colour the design of the unit is most pleasing. While the main object of this unit is to provide as much accommodation as possible, it also serves to show how kitchen planning can be simplified by its use and much time and labour saved.

Accounting with Increased Service.

As a result of many years' study of public utility companies' accounting requirements, a new accounting machine has now been marketed which makes possible economies of time and effort. Although machines have for some years been available which do away with the use of books in connection with the billing of customers' accounts, the new machine is claimed to mark a great advance in mechanized accounting. The bookless system just marketed by the National Cash Register Company, Ltd., is known as the "Stub" or "Duplicate Bill" plan, depending on the system selected for use. In the case of the stub plan an original bill is prepared with two or three stubs to contain the necessary office records, while in the other plan the actual bill is prepared in duplicate with one or two stubs for collection and follow-up purposes. With this new machine the consumer's bill, the duplicate or office stub, the collection or receipting stub, the follow-up notice, and the billing summary are all printed *simultaneously* without any repeat operations or the use of carbons. The saving of time in performing so many operations at once, and the saving of expense through the elimination of carbons, are obvious. Five copies of each transaction are printed at the same time. The machine automatically provides dissection of all work performed over a large number of heads. This is simply a by-product in the making out of bills, and immediately the work is concluded any desired information as to number of units, charges for rent of apparatus, meter rent, &c., is instantly available. Thus all effort formerly expended in analysis work is eliminated. Automatic features have been incorporated to a remarkable degree, and high speed is possible because it is not necessary to wait for a cycle operation by the machine's mechanism or for a returning carriage. The bills are automatically stacked.

Athletic and Social

Cambridge Recreation Club Party.

Desiring more opportunities for social intercourse, " Mr. Therm " was the invisible but popular host at an experimental party held recently in connection with the recreation club of Cambridge University and Town Gas Light Company. The large clubroom, decked in Coronation colours, radiated light, warmth, and cheerfulness, and the Committee responsible for the arrangements were congratulated on a well-balanced programme of dancing, games, and other entertainment.

Chester Co-Partnership Scheme.

It was reported at the annual meeting of Chester United Gas Company Co-Partnership Scheme that the Directors had credited the co-partnership fund with £1,485, enabling the bonus to continue at 6½% on wages and salaries. During the year co-partners have purchased £700 of the Company's ordinary stock. This is nearly £200 more than the previous year.

The number of employees and representatives of deceased co-partners, who possess holdings of the Company's stock is now 129, and the stock certificates amount in the aggregate to £8,800. The value of these holdings is £9,700, and in addition to that there are pass-book balances of £5,268. In anticipation of applications for further stock, the trustees have purchased stock as opportunity has presented itself.

Blackburn Social and Benevolent Club.

At the annual meeting of Blackburn Corporation Gas Department Social and Benevolent Club the following officers were elected: President, Councillor H. Johnson (Chairman of the Gas Committee); Vice-Presidents, Alderman E. Hamer, J.P., Councillor J. T. Taylor, Mr. J. D. Ashworth (Engineer and Manager), and Mr. T. E. Richmond (Commercial and Sales Superintendent); Chairman, Mr. H. N. Dann; Vice-Chairman, Mr. R. Dixon; Secretary, Mr. George Beardwood; Treasurer, Mr. F. Westwell; Trustees, Messrs. J. D. Ashworth and E. B. Field; Auditors, Messrs. E. M. Bates and H. Hudson.

The report of the Society showed a membership of 230. The benevolent section had paid out £88 during the year in sick benefits, and the savings bank was another satisfactory feature, over £1,000 having been disbursed during the holidays. The Club also ran football, cricket, bowling, and billiards teams. During the summer there were tennis courts in use, and in the winter whist drives were organized. Altogether the Secretary said they had a very live club, of which the members had reason to be proud. They were known all over the country, details of organization and rules being requested from various Corporation bodies and private firms.

Mr. E. B. Field, retiring Chairman, was thanked on the motion of Mr. H. N. Dann.

Bromley Gas Workers' Dinner.

Mr. T. H. Day, President of Suburbagas (Bromley) Social and Athletic Club, presided over a company of more than eighty at a dinner held by the Club at the Royal Bell Hotel, Bromley, recently.

Mr. F. Ancell, proposing the toast of the " South Suburban Gas Company," expressed regret at Dr. C. C. Carpenter's retirement from the chairmanship of the Board of Directors, owing to ill-health. Mr. F. H. Jones, his successor, had their best wishes. Response was made by Mr. V. Simmonds (Engineer to the Company), who conveyed the regret of the General Manager and Secretary, Mr. T. Brown, at being unable to be present.

Mr. J. A. Gould (Distribution Engineer) spoke of the Sports Guild, in which the Board of Directors had always taken a keen interest. He was sure that interest would be continued with Mr. Jones as Chairman.

Mr. G. Manley, proposing the toast of the " South Suburban Gas Amateur Sports Guild," said the Guild was founded seven years ago and now had a membership of nearly 2,000, with seven fully equipped sports grounds. In Bromley there were 200 members. The Guild had great support from the Company, which paid two units for every one subscribed by members. With the toast, Mr. Manley coupled the names of Mr. S. G. Hollman (Chairman) and Mr. M. E. J. Ingham (Secretary).

Mr. J. Castlo, proposing the toast of " Suburbagas (Bromley) Social and Athletic Club," said that the Club had built up a record of which they might well be proud. The cricket team had reached the final of the Guild Cup, and the football eleven had reached the final of the Wastell Cup. He coupled with the toast the names of Mr. Day and Mr. W. E. Hickmott (Assistant Secretary). Mr. Day, responding, said he was sure that the Club's high standard of sportsmanship had done much to further the good name of the Company in the eyes of Bromley people.

Hampton Court Directors' Splendid Offer.

Members of the Hampton Court Gas Company Athletic Club who attended the recent annual dinner at Kingston heard that the Directors of the Company had agreed to provide them with entirely new club premises to be built in the club playing field at Wick Road, Teddington. They will provide accommodation for billiards, table tennis, and other games and a library, and work will commence on the building as soon as the plans are completed.

A company of 110 sat down to dinner, a happy, informal evening including an excellent musical entertainment. Mr. C. W. Kent (Chairman of the Directors and President of the Club) presided, and others present were the Mayor of Twickenham (Mr. E. Ollis), Messrs. J. Symmons (Director), C. T. Price (General Manager and Engineer), M. C. Lamb (Secretary), H. J. Hodder (Assistant Manager), J. H. Johnson, F. S. Hallam, E. Weaver, C. Oldridge, and A. J. Cusiack. The dinner was arranged by the committee of the club, of which Mr. R. B. Buller is the Hon. Secretary.

The health of the visitors was proposed by Mr. Price, who particularly welcomed the old pensioners of the Company and the Mayor. Replying, Mr. Ollis said when he was among sportsmen he felt he was among friends

Thanks to the Directors for their generosity in providing the new club were expressed by Mr. Price.

Mr. Kent then presented long service awards to Messrs. H. W. Stevens, M. C. Lamb, L. Turner, and T. Turnham, and sports awards as follow: Club bat for cricket, S. West; Bowling Medal, C. Sparling; Harry Field cup for departmental matches, offices and showrooms; Symmons cup for tennis, P. Whitbread; runner-up medal, C. J. Martin; Kent swimming cup, H. Cox; runner-up medal, L. Mowbray; Price billiards cup, R. Wood; runner-up medal, A. G. Orchard; Lamb snooker cup, T. G. Goulter; runner-up medal, C. C. Ketcher. Mr. C. Canham was presented with a silver cigarette case from the players and committee of the football section in recognition of his captaincy.

The health of the President was proposed by Mr. Lamb, who said in Mr. Kent they had a great sportsman. Mr. Kent expressed his thanks for the toast, which was drunk with musical honours.

Entertainment during dinner was provided by Mr. George Kempton's " Versatility " Concert Party.

Cardiff Co-Partnership Meeting.

A meeting of the co-partnership committee of the Cardiff Gas Light and Coke Company was held on March 25, 1937, Mr. Lawrence G. Williams (Chairman of Directors) presiding. He was supported by Mr. Robert H. Williams (Deputy-Chairman), Mr. James Miles (Director), Mr. H. D. Madden (Engineer and Manager), Mr. R. J. Auckland (Secretary), and Mr. B. J. Bell (District Superintendent).

The co-partners' elected representatives present were as follows: Messrs. J. E. Jenkins (Staff), A. E. Hall and J. G. Lewis (Grangetown Works), A. Whitlock and O. Wilcox (Bute Terrace), and H. S. Brown (Mains and Services).

In presenting the statement of accounts and Committee report to the meeting, the Chairman said the amount allocated by the Directors to the credit of the Co-partnership Fund—namely, £6,769—was the same as for the previous year. The rate at which this bonus would be distributed among the co-partners was 6⅛% upon wages and salaries. That did not mean that the individual bonus of each co-partner was substantially different from last year, however, although the rate was lower by ¼% than was declared last year. That was very easily explained—first, the rate of wages paid during the year had been increased; secondly, 1936 was a leap year.

The group life insurance scheme was proving of considerable benefit to relatives of co-partners. During the year 1936 five claims had been promptly met, amounting to a total benefit of £600. Altogether, since the scheme commenced in 1932, the total claims paid amounted to £2,600. The amount of stock transferred to co-partners last year was £2,524, at a total cost, including stamp duty, of £3,395, or an average of £134 9s. 10d.%.

The Chairman then moved the adoption of the co-partnership accounts and the Committee report. This was seconded by Mr. J. E. Jenkins. Mr. A. E. Hall and Mr. J. G. Lewis made reference to the generous way in which the Directors had met the wishes of co-partners in regard to the bonus. Housing difficulties were real problems, and the permission to use balances to assist in house purchases had added greatly to their comfort and happiness. Those also who had met with sickness and other troubles were greatly benefited and they all realized the boon of co-partnership.

The report and accounts were adopted unanimously. Mr. Wilfred Jones was re-elected as auditor of the co-partnership accounts for the ensuing year, and a vote of thanks was accorded to him for his past services.

The meeting terminated after a vote of thanks to the Chairman for presiding had been proposed by Mr. A. Whitlock, seconded by Mr. J. E. Jenkins, and carried unanimously.

Standard sizes of

STANTON PIPES

always in stock

"New" Spun Iron Pipes

12 Feet Lengths	18 Feet Lengths
DIAMETER INS.	DIAMETER INS.
3	—
4	4
6	6
7	7
8	8
9	9
10	10
12	12

Vertically-cast Pipes

9 Feet Lengths	12 Feet Lengths
DIAMETER INS.	DIAMETER INS.
3	—
4	4
6	6
8	8
9	9
10	10
12	12
	15
	18
	24

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Gas Markets and Manufactures

Stock Market Report

(For Stock and Share Lists, see later pages)

So well were the Budget secrets kept this year that the Chancellor's National Defence Contribution tax came as a shock to the Stock Exchange, with the result that business was restricted and prices in the industrial and speculative sections came down with a bump. Confidence in the country's financial stability is such, however, that Gilt-edged and many other high-class investment securities more than maintained their popularity and closed at higher values. Home rails were particularly firm, the rumour that the companies may seek permission to increase freights and fares and also that they are unlikely to be affected by the N.D.C. both attributing to the increased popularity of this market. Industrials will probably be "jumpy" for some little time, or at any rate until the details of the new tax are fully known, when some recovery will doubtless take place.

In common with other securities of a similar class, Gas stocks and shares came through the week practically unscathed. The volume of business was on a slightly reduced scale, but it will be seen in the Stock and Share Lists that very few prices were changed either way. A feature was the continued strength of Gas Light and Newcastle units, both of which were again marked up. As mentioned above, until the N.D.C. proposals are in their final form, it is impossible to comment on them in so far as they may affect investors in Gas stocks.

The Directors of the South-Eastern Gas Corporation are recommending a final dividend on the ordinary shares at the rate of 6% per annum in respect of the half-year to March 31, making a payment at the rate of 6% per annum from the respective dates at which the shares began to rank for dividend. A similar rate of dividend has been paid for each year since 1933-34. At the time of writing, the shares are still *cum* div. at 25s., giving a return of £4 16s.%.

Another dividend announcement last week was that of the Primitiva Gas Company of Buenos Aires (a subsidiary of Primitiva Holdings, Ltd.), which is paying 2%, free of tax, for the year ended Dec. 31, payable on April 29.

Current Sales of Gas Products

The London Market for Tar Products.

April 26.

There is little of interest to report in the London Tar Products markets, prices being as under:

Pitch, 36s. to 37s. per ton f.o.b.
Creosote, 6d.
Refined tar, 3¾d.
Pure toluole, 2s. 4d. to 2s. 5d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, about 1s. 8d.; and 90/160 pyridine, about 9s.—all per gallon naked at makers' works.

Tar Products in the Provinces.

April 26.

The average prices of gas-works products during the week were: Gas-works tar, 21s. 9d. to 26s. 9d. Pitch—East Coast, 35s. to 36s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 35s. to 36s.* Toluole, naked, North, 2s. to 2s. 1d. Coal tar crude naphtha, in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 6¼d. to 1s. 6½d. Heavy naphtha, North, 1s. 3d. to 1s. 3½d. Creosote, *ex* works, in bulk, North, liquid and salty, 5d. to 5½d.; low gravity, 4⅝d. to 4¾d. Heavy oils, in bulk, North, 5d. to 5¼d. Carbolic acid 60's, 3s. 1d. to 3s. 3d. Naphthalene, £18 to £20. Salts, 90s. to 95s., bags included. Anthracene "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be neecssary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *April* 24.

Trading is again active and, with supplies of many products rather scarce, prices tend upwards.

Crude gas-works tar.—The actual value is 86s. to 87s. per ton *ex* works in bulk.

Pitch.—The shipping season is now practically finished and value is nominal at about 30s. to 32s. 6d. per ton f.o.b. Glasgow for export, and 30s. per ton *ex* works in bulk for home trade.

Refined tar is quoted quite freely at round 3d. to 3¼d. per gallon free on rails for export, and 3½d. to 3¾d. per gallon *ex* works in buyers' packages for home trade.

Creosote oil.—This is a steady market with makers' prices not lower than the following: Specification oil, 5½d. to 5¾d. per gallon; low gravity, 5¾d. to 6d. per gallon; neutral oil, 5¼d. to 5½d. per gallon; all *ex* works in bulk.

Cresylic acid.—With supplies short and demand continuing strong, values show a further increase during the week. Pale, 97/99%, 4s. 3d. to 4s. 5d. per gallon; dark, 97/99%, 4s. to 4s. 2d. per gallon; and pale, 99/100%, 4s. 8d. to 4s. 11d. per gallon; all *ex* works in buyers' packages.

Crude naphtha is commanding round 6d. to 6¼d. per gallon *ex* works in bulk, according to quality and district.

Solvent naphtha.—90/160 grade is quoted at 1s. 4¼d. to 1s. 5½d. per gallon, and 90/190 heavy naphtha is 11d. to 1s. per gallon.

Motor benzole is obtainable at 1s. 4d. to 1s. 4½d. per gallon.

Pyridine.—Prices are nominal at 7s. to 8s. per gallon for 90/160 grade, and 8s. to 9s. per gallon for 90/140 grade.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	9½	to	0	10	per gallon at works
Motor ,,	1	3	,,	1	3½	,, ,, ,,
90% ,,	1	4	,,	1	4½	,, ,, ,,
Pure ,,	1	8	,,	1	8½	,, ,, ,,

Contracts Advertised To-Day

Coal.

Goole Gas Department. [p. 232.]
Sowerby Bridge Gas Department. [p. 232.]

Condenser.

Lincoln Gas Department. [p. 232.]

Exhauster.

Lincoln Gas Department. [p. 232.]

Mantles.

Ellesmere Port Gas Department. [p. 232.]

Meters.

Ellesmere Port Gas Department. [p. 232.]

Pipes and Specials.

Ellesmere Port Gas Department. [p. 232.]

Piping (Steam and Water).

Lincoln Gas Department. [p. 232.]

Tar Extractor.

Lincoln Gas Department. [p. 232.]

Tar and Liquor Drains.

Lincoln Gas Department. [p. 232.]

Tubes and Fittings.

Ellesmere Port Gas Department. [p. 232.]

Underpressure Work.

Lincoln Gas Department. [p. 232.]

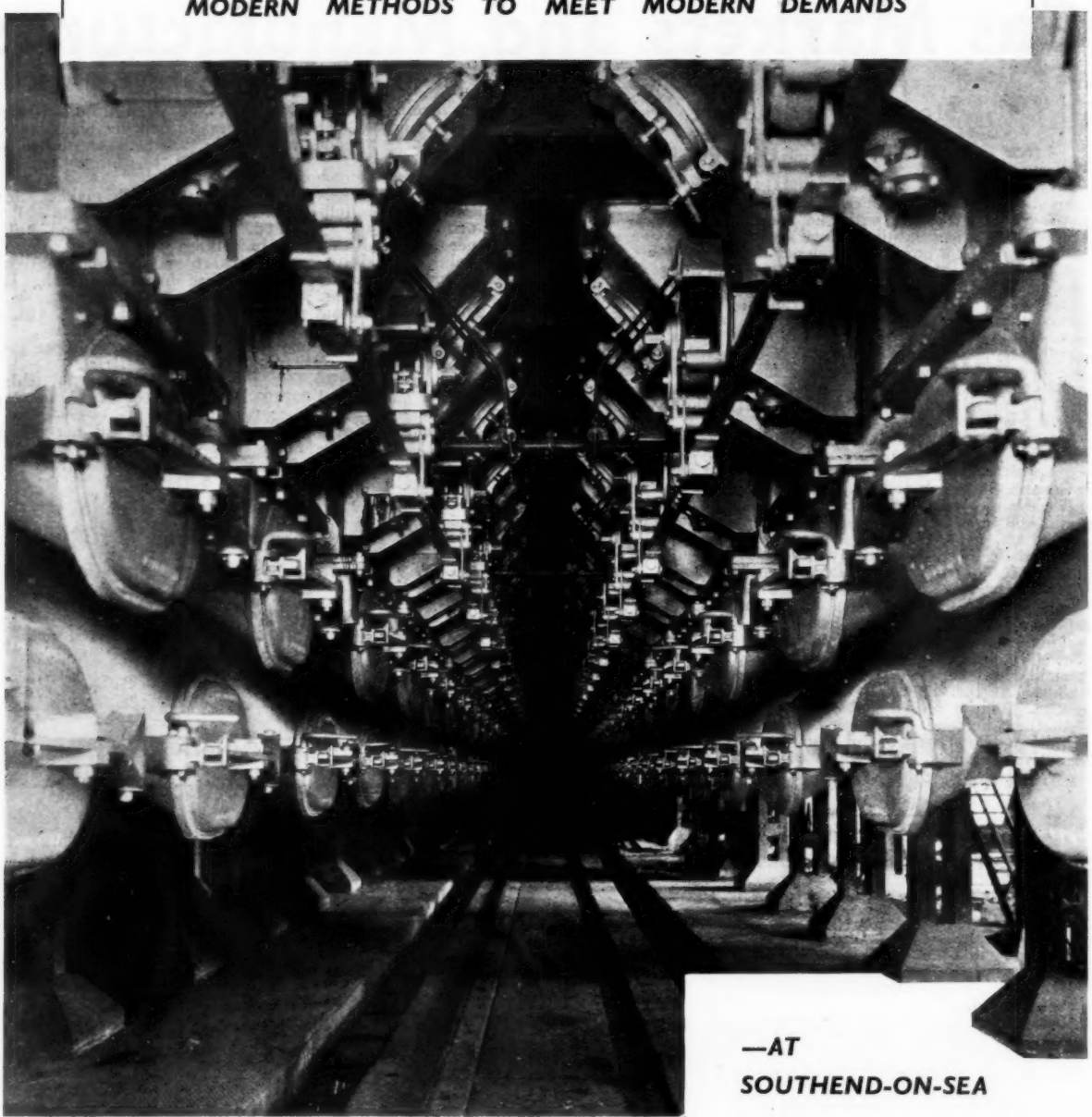
Valves and Connections.

Lincoln Gas Department. [p. 232.]

Washers (Livesey and Static).

Lincoln Gas Department. [p. 232.]

MODERN METHODS TO MEET MODERN DEMANDS



—AT SOUTHEND-ON-SEA

Installation of Glover-West vertical retorts which has now begun regular service at the Southend-on-Sea Station of the Gas Light and Coke Company (London). A view below the retort bench showing coke extractors, coke discharging mouthpieces and West lip bucket conveyors.

405 West-built carbonizing plants erected totalling **10,556** retorts and chambers with a nominal daily make of **579** million c.ft.

THE WEST SYSTEMS

GLOVER-WEST VERTICAL RETORTS ● WESTVERTICAL CARBONIZING CHAMBERS

WEST'S GAS IMPROVEMENT COMPANY, LTD.

MANCHESTER: Albion Ironworks, Miles Platting — 'Phone: COLLYHURST 2961 : 'Grams: "STOKER, MANCHESTER"

LONDON: Columbia House, Aldwych, W.C.2 — 'Phone: HOLBORN 4108 : 'Grams: "WESGASCO, ESTRAND, LONDON"

STOCK AND SHARE LIST

Official Quotations on the London Stock Exchange

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Apl. 23.	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Week.
1,767,439	Stk.	Mar. 15	8	8	Alliance & Dublin Ord. ...	162—167	...	...
374,000	,,	Dec. 14	4	4	Do. 4 p.c. Deb. ...	96—101	...	...
558,890	,,	Feb. 15	7	7	Barnet Ord. 7 p.c.	160—165	...	...
300,000	1	Apl. 5	1/4⅛	1/9⅜	Bombay, Ltd.	25/6—27/6*	...	...
179,915	Stk.	Mar. 1	9½	9½	Bournemouth sliding scale ...	195—205	...	166
590,407	,,	,,	7	7	Do. 7 p.c. max. ...	163—168	...	134
493,960	,,	,,	6	6	Do. 6 p.c. Pref. ...	133—138	...	82
50,000	,,	Dec. 14	3	3	Do. 3 p.c. Deb. ...	80—85	...	...
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	100—105	...	...
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
357,900	,,	Feb. 15	7½	7½	Brighton, &c., 6 p.c. Con. ...	155—160	...	...
649,955	,,	,,	6¼	6¼	Do. 5 p.c. Con. ...	140—145	...	...
205,500	,,	,,	6	6	Do. 6 p.c. 'B' Pref.	130—135	...	...
855,000	,,	Mar. 1	7	8	British Ord.	150—155	...	151½—152½
100,000	,,	Dec. 14	7	7	Do. 7 p.c. Pref.	143—148	...	143
350,000	,,	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	103—108	...	...
450,000	,,	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref. ...	1⅛—3½	...	...
150,000	Stk.	Jan. 4	4½	4½	Do. 4½ p.c. Deb. ...	80—85	...	...
626,860	,,	Feb. 1	6	6	Cardiff Con. Ord.	120—125	...	...
237,860	,,	Dec. 14	5	5	Do. 5 p.c. Red. Deb.	107—112	...	...
98,936	1	Apl. 5	2/-	2/-	Colombo Ord.	1⅞—1⅞*	...	...
24,510	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. ...	23/—25/-*	...	...
739,453	1	Mar. 15	-/11·48	-/11·48	Colonial Gas Assn. Ltd. Ord.	17/—19/-	...	...
296,144	1	,,	1/3·30	1/3·30	Do. 8 p.c. Pref.	22/—24/-	...	...
1,775,005	Stk.	Feb. 1	5	5	Commercial Ord.	88—93	...	...
620,000	,,	Nov. 30	3	3	Do. 3 p.c. Deb. ...	73—78	...	74½
286,344	,,	Feb. 15	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
807,560	,,	Feb. 15	7	7	Croydon sliding scale ...	142—147	...	143
644,590	,,	,,	5	5	Do. max. div.	109—114	...	110—111½
620,385	,,	Dec. 14	5	5	Do. 5 p.c. Deb.... ...	115—120	...	117—118
239,000	,,	Feb. 1	5	5	East Hull Ord. 5 p.c.... ...	100—105	...	103
185,355	,,	Feb. 15	6	6	East Surrey Ord. 5 p.c. ...	122—127	...	125—125½
176,211	,,	Dec. 14	5	5	Do. 5 p.c. Deb. ...	113—118	...	...
250,000	1	Nov. 16	6	4	Gas Consolidation Ord. ...	20/—22/-	...	...
250,000	1	,,	4	4	Do. 4 p.c. Red Cum. Pref.	19/—21/-	...	...
19,255,284	Stk.	Feb. 1	5½	5½	Gas Light & Coke 4 p.c. Ord.	25/6—26/6a	+-/3	25/9—26/4½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	79—82	...	80½—82
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	100—103	+1	101—102½
8,602,497	,,	Nov. 30	3	3	Do. 3 p.c. Con. Deb. ...	78—81	...	78—80
3,647,770	,,	,,	5	5	Do. 5 p.c. Red. Deb....	110—113	...	112
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb....	108—111	...	...
700,000	,,	Mar. 1	25/5§	3½	Do. 3½ p.c. Red. Deb....	98—101	...	100—100½
270,466	,,	Feb. 15	6	6	Harrogate New Cons. ...	122—127	...	...
213,200	,,	Feb. 15	6	6	Hornsey Con. 3½ p.c. ...	120—125	...	123
5,600,000	,,	Nov. 2	12	8	Imperial Continental Cap. ...	157—162	...	157½—160
223,130	,,	Feb. 1	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...	...
285,242	,,	Mar. 1	8½	8½	Lea Bridge 5 p.c. Ord. ...	160—165	...	160½
11,751	,,	Mar. 1	8	10	Maidstone Gas 5 p.c. Cap. Stk.	180—190	...	...
63,480	,,	Dec. 14	3	3	Do. 3 p.c.Prp.Db.Sk.	72—77	...	...
75,000	,,	Nov. 30	†10	†10	Malta & Mediterranean ...	150—160	...	...
392,000	—	Apl. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	98—103	...	...
231,978	Stk.	Feb. 15	5	5	M.S. Utility 'C' Cons. ...	102—107	...	...
968,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	95—100	...	98½
360,075	,,	Dec 14	4	4	Do. 4 p.c. Deb. ...	97—102	...	...
148,955	,,	,,	5	†5	Do. 5 p.c. Deb. ...	115—120	...	...
125,000	—	Jan. 4	3½	3½	Do. 3½ p.c. Rd.Rg.Bds.	97—100	...	...
675,000	Stk.	Nov. 16	†6	†6	Montevideo, Ltd.	83—88	...	82
250,000	,,	Feb. 15	7½	7½	North Middlesex 6 p.c. Con.	160—165	...	...
396,160	,,	Feb. 1	5	5	Northampton 5 p.c. max. ...	102—107	...	...
300,000	,,	Apl. 19	†9	†7	Oriental, Ltd....	162—167*	−3	...
416,617	,,	Dec. 14	8	8	Plymouth & Stonehouse 5 p.c.	165—170	−2	165
621,667	,,	Feb. 15	8½	8½	Portsmouth & Gosport Cons.	167—172	−3	173
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	105—110	...	105
73,350	,,	,,	...	5	Do. 5 p.c. Pref. ...	112—117	...	115
363,470	1	Sept. 21	1/-	1/-	Severn Val. Gas Cor. Ld. Ord.	20/—22/-	...	...
454,510	1	Mar. 15	-/10⅝	-/10⅝	,, ,, 4½ p.c. Cum. Pref.	20/—22/-	..	...
133,201	Stk.	Feb. 15	5	8½	Shrewsbury 5 p.c. Ord. ...	133—138	...	...
90,000	10	June 8	‡3½	‡4	South African...	4—5	...	...
1,152,635	1	Sept. 7	1/2⅝	1/2⅝	South East'n Gas. Cn.Ld. Ord.	24-/—26/-	...	...
845,511	1	Mar. 1	-/10⅜	-/10⅜	Do. 4½ p.c. Red. Cum. Pref.	20/—22/-	...	...
200,000	1	,,	4	4	Do. 4 p.c. Cum. Pref. ...	19/6—21/6	...	...
450,000	,,	Feb. 15	4	4	Do. 4 p.c. Deb.	100—102	...	...
150,000	Stk.	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	99—101	...	...
6,709,895	,,	Feb. 1	5	6	South Met. Ord.	107—112	...	108—109½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf. ...	132—137	...	132½—133
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf. ...	96—101	...	98
1,895,445	,,	Dec. 14	3	3	Do. 3 p.c. Deb. ...	74—79	...	76½—78
1,000,000	,,	Jan. 4	5	5	Do. 5 p.c. Red. Deb....	107—112	...	109—112
1,543,795	,,	Feb. 1	6	6	South Suburban Ord. 5 p.c....	122—127	...	124—125
512,825	,,	,,	5	5	Do. 5 p.c. Pref....	112—117	...	...
500,000	,,	,,	4	4	Do. 4 p.c. Pref....	95—100	...	...
888,587	,,	Dec. 14	5	5	Do. 5 p.c. Deb....	115—120	...	116½
250,000	,,	,,	4	4	Do. 4 p.c. Deb....	98—103	...	...
427,859	1	Nov. 16	1/2⅝	9⅜	S. Western Gas & Water Ord.	19/—21/-	−1/-	...
160,523	1	Apl. 19	-/10⅝	-/10⅝	Do. 4½ p.c. Red. Cum. Pf.	20/—22/-*	—/6	...
110,000	Stk.	Dec. 14	4	4	Do. 4 p.c. Red. Deb. ...	98—103	...	...
750,541	,,	Feb. 1	5	5½	Southampton Ord. 5 p.c. ...	111—116	...	...
148,836	,,	Jan. 4	4	4	Do. 4 p.c. Deb.	98—103	...	...
350,000	,,	Feb. 15	5½	5½	Swansea 5½ p.c. Red. Pref. ...	110—115	...	...
106,000	,,	Jan. 4	6½	6½	Do. 6½ p.c. Red. Deb. ...	98—101	...	...
94,000	,,	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...	...
1,076,490	,,	Feb. 15	6⅜	6⅜	Tottenham and District Ord.	137—142	...	141
409,835	,,	,,	5½	5½	Do. 5½ p.c. Pref....	123—128	...	123½
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	110—115	...	...
371,850	,,	Nov. 30	4	4	Do. 4 p.c. Deb. ...	98—103	...	...
373,939	,,	Feb. 15	7	7	Uxbridge, &c., 5 p.c. ...	142—147	...	...
133,010	,,	,,	5	5	Do. 5 p.c. Pref. ...	110—115	...	...
1,371,138	,,	Feb. 1	7	7	Wandsworth Consolidated ...	142—147	...	146⅜
1,620,615	,,	,,	5	5	Do. 5 p.c. Pref ...	113—118	...	114—116
500,000	,,	,,	33/4	4	Do. 4 p.c. Pref. ...	95—100	...	...
1,343,964	,,	Dec. 14	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
383,745	,,	,,	4	4	Do. 4 p.c. Deb. ...	98—103	...	...
558,342	,,	Feb. 1	7	7	Watford and St. Albans Ord.	142—147	...	144½—145
200,000	,,	,,	5	5	Do. 5 p.c. Pref. ...	110—115	...	...
200,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	123—128	...	...
200,000	,,	Dec 14	4	4	Do. 4 p.c. Red. Deb.	97—102	...	...
100,000	,,	,,	3½	3½	Do. 3½ p.c. Red.Deb.	95—100	...	...

a.—The quotation is per £1 of Stock. * Ex div. † Paid free of income-tax. ‡ For year. § Actual.

Stock and Share List continued overleaf.

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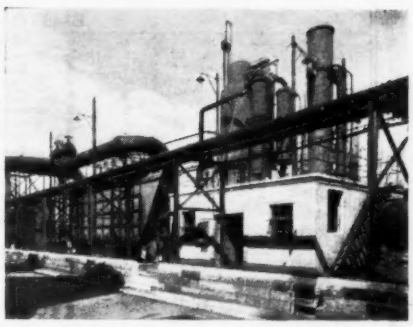

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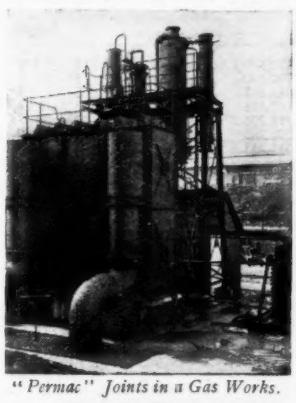

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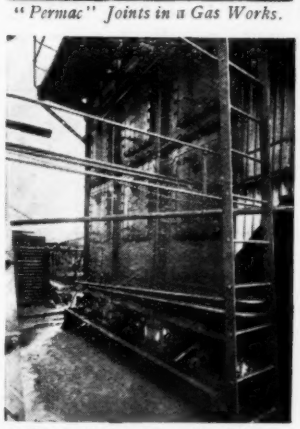

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Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Apl. 23.	Rise or Fall on Week.	Transactions, Lowest and Highest During the Week.
BRISTOL EXCHANGE.								
347,756	Stk.	Feb. 1	5	6	Bath Cons.	120—122	...	...
1,667,250	,,	Feb. 15	5	5	Bristol, 5 p.c. max.	113—115	...	...
120,420	,,	Dec. 14	4	4	Do. 1st 4 p.c. Deb. ...	101—103	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	101—103	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	122—125	...	...
274,000	,,	Mar. 1	5	5	Newport (Mon.) 5 p.c.max. ...	103—108	−4½	...
13,200	12	Mar. 15	7	8	Pontyp'l Gas & W. 10 p.c. 'A'	13½—14½	...	...
13,600	10	,,	5	6	Do. 7 p.c. 'B'	12—12½	...	...
40,000	10	,,	5	6	Do. 7 p.c. 'C'	12—12½	...	...
140,778	Stk.	Feb. 1	5	5	Weston-super-Mare Cons. ...	112—113	...	...
64,338	,,	Dec. 14	4	4	Do. 4 p.c. Deb.	98—101	...	...
33,340	,,	,,	7½	7½	Do. 7½ p.c. Deb.	160—163	...	...
LIVERPOOL EXCHANGE.								
157,150	Stk.	Feb. 1	5	6½	Chester 5 p.c. Ord.	106—111	...	...
92,500	,,	Dec. 14	4½	4	Do. 4 p.c. Pref.	98—102	...	...
36,430	,,	,,	3	3½	Do. 3½ p.c. Deb.... ...	90—95	...	...
41,890	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	99—103	...	...
2,167,410	,,	Feb. 15	6	6	Liverpool 5 p.c. Ord. ...	124½—126½	+1	...
245,500	,,	Dec. 14	5	5	Do. 5 p.c. Red. Pref. ...	101—106	...	...
306,083	,,	Jan. 4	4	4	Do. 4 p.c. Deb. ...	103—105	...	...
106,280	,,	Feb. 1	10	10	Preston 'A' 10 p.c.	210—220	...	...
188,219	,,	,,	7	7	Do. 'B' 7 p.c.	150—160	...	...
NEWCASTLE EXCHANGE.								
122,577	Stk.	Feb. 1	8	8	Blyth 5 p.c. Ord.	166—168	...	...
732,000	,,	Feb. 15	5	5	Hartlepool G. & W. Cn. & New	125—127	...	...
2,061,315	,,	Feb. 1	5	5⅜	Newcastle & Gateshead Con.	24/9—25/3*a*	+-/3	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	99—101	...	...
776,706	,,	Jan. 4	3½	3½	Do. 3½ p.c. Deb. ...	90—100	−2½	...
277,285	,,	Nov. 2	5	5	Do. 5 p.c. Deb. '43...	108—109	...	...
332,351	,,	Feb. 1	6	6	Sunderland 6 p.c. max. ...	139—141	...	...
NOTTINGHAM EXCHANGE.								
542,270	Stk.	Mar. 1	7	9	Derby Con.	160—180	...	...
55,000	,,	Dec. 14	4	4	Do. 4 p.c. Deb.	100—105	...	...
84,750	,,	Feb. 17	5	12	Long Eaton 'A' Ord. ...	...	...	...
50,000	,,	,,	4	10	Do. 'B' Ord. ...	...	...	...
20,000	10	Dec. 14	5	5	Do. 5 p.c. Pref. ...	10—12	...	...
80,000	Stk.	,,	5	5	Do. 5 p.c. Deb. ...	105—110	...	...
SHEFFIELD EXCHANGE.								
10,000	Stk.	Aug. 10	10	10	Great Grimsby 'A' Ord. ...	210—220	...	...
6,500	,,	,,	10	10	Do. 'B' Ord. ...	210—220	...	...
79,000	,,	,,	10	10	Do. 'C' Ord. ...	205—210	...	...
1,806,339	,,	Feb. 15	6	6½	Sheffield Cons.	143—145	...	...
95,000	,,	Jan. 4	4	4	Do. 4 p.c. Deb.	101—104	...	...

Supplementary List of Stocks and Shares not Officially Quoted

202,152	Stk.	Mar. 15	25/-*b*	25/-*b*	Ascot Ord.	102—107	...	...
128,182	,,	Jan. 4	5	5	Do. 5 p.c. Pref.	110—115	...	...
312,083	1	Nov. 16	5	5	Assd. Gas and Water Ord. ...	19/6—21/6	...	...
326,071	1	,,	4½	4½	Do. 4½ p.c. Cum. Pref. ...	19/6—21/6	...	21/3
150,000	Stk.	Mar. 15	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...	97
17,000	,,	Feb. 15	8	8	Bognor Orig. Ord. 'A' ...	160—170	...	...
62,210	,,	,,	8	8	Do. New Addl. 'A' ...	160—170	...	...
87,160	,,	,,	7	7	Do. New 7 p.c. max. ...	140—145	...	...
37,440	,,	Feb. 1	10	10	Cam. Univ. & Town 10 p.c.max.	195—205	...	...
125,970	,,	,,	7	7	Do. 7 p.c. max.	137—142	−3	141
39,025	,,	,,	5	5	Do. 5 p.c. max.	98—103	...	...
65,000	,,	Mar. 1	7½	8½	Eastbourne 'A' 5 p.c. ...	160—165	...	...
198,000	,,	,,	6	7	Do. 'B' 3½ p.c.	130—140	...	...
112,312	,,	,,	5	5	Do. 5 p.c. Pref.	110—115	...	...
130,000	,,	Dec. 14	5	5	Do. 5 p.c. Deb.	115—120	...	117
24,000	30	Feb. 1	8½	8½	Great Yarmouth 8½ p.c. max.	45—50	...	...
59,400	30	,,	7½	7½	Do. 7½ p.c. max.	40—45	...	...
51,160	Stk.	Dec. 14	5½	5½	Do. 5½ p.c. Deb.	122—127	...	127½
152,600	,,	Feb. 15	8	9	Guildford Cons.	190—200	...	...
54,055	,,	,,	5	5	Do. 5 p.c. Pref.	112—117	...	...
68,250	,,	Dec. 14	5	5	Do. 5 p.c. Deb.	115—120	...	...
156,600	,,	Feb. 15	7½	7½	Hampton Court Cons. ...	150—160	...	...
107,960	10	Mar. 15	4	5½	Mid Kent Ord.	9—10	...	...
230,940	Stk.	Feb. 15	10	10	Oxford & District Ord. ...	200—210	...	...
47,112	,,	,,	5	5	Do. 5 p.c. Pref.	110—115	...	...
50,000	,,	,,	6	6	Do. 6 p.c. Red. Pref. ...	112—117	...	...
126,193	,,	Nov. 16	7½	7½	Peterborough Ord.	162—172	...	...
64,990	,,	Mar. 15	6½	7½	Redditch Ord.	127—137	...	...
166,850	,,	Feb. 15	8	8	Romford Ord.	157—167	...	...
60,000	,,	,,	4	4	Do. 4 p.c. Pref.	97—100	...	...
44,000	,,	Mar. 15	5	5	Do. 5 p.c. Deb.	115—120*	...	...
10,950	,,	Mar. 1	8	8	Ryde Ord.	160—165	...	...
136,191	,,	Feb. 15	5	7	Scarborough Ord.	123—133	...	...
27,825	,,	Feb. 1	8	8	Shanklin & Ventnor Cons. ...	165—175	...	...
270,086	,,	Mar. 15	7	7	Slough Ord.	137—142	...	...
21,000	,,	Dec. 14	5	5	Do. 5 p.c. Deb.... ...	113—118	...	...
28,872	1	Nov. 2	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	19/—22/-	...	...
28,866	1	Mar. 15	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	18/6—20/6	...	...
137,730	Stk.	Feb. 15	7	7	Southgate & Dist. 7 p.c. max.	135—145	...	...
62,500	,,	,,	5	5	Do. 5 p.c. Pref.	110—115	...	...
117,228	,,	Feb. 15	6	5	Swindon Cons.	108—113	...	...
60,425	,,	Dec. 14	5	5	Do. 5 p.c. Deb.	113—118	...	...
64,380	,,	Dec. 14	5	5	Torquay and Paignton 5 p.c. Pf.	115—120	...	...
750,000	1	Apl. 5	4	6	Utd. Kingdom Gas Cpn. Ord.	20/—22/-*	...	21/6—21/9
936,338	1	Nov. 16	4½	4½	Do. 4½ p.c. 1st Cum. Pref.	20/—22/-	...	20/9—21/3
674,084	1	Apl. 5	4½	4½	Do. 4½ p.c. 2nd Non-Cum. Pref.... ...	18/6—20/6*	...	...
600,000	Stk.	Mar. 15	3½	3½	Do. 3½ p.c. Red. Deb. ...	96—101	...	...
130,000	,,	Feb. 15	5	8	Wakefield Ord.	132—137	...	...
81,650	,,	,,	5	5	Do. 5 p.c. max.	103—108	...	...
82,000	,,	Feb. 1	6	6	Weymouth Ord.	103—108	...	...
98,384	,,	Feb. 1	6	6	Wolverhampton 6 p.c. Pref....	125—130	...	127½
160,000	,,	Dec. 14	5½	5½	Do. 5½ p.c. Rd. Db	110—115	...	...
370,000	,,	Feb. 15	4	6	York Cons.	105—110	...	...
90,000	,,	Dec. 14	5	5½	Do. 5 p.c. Red. Deb. ...	105—110	...	...
133,640	,,	Mar. 1	6½	6½	Yorktown (Cam.) 5 p.c ons.	130—135	...	...
120,000	,,	,,	5	5	Do. 5 p.c. Pref.	110—115	...	...
35,000	,,	Dec. 14	5½	5½	Do. 5½ p.c. Deb.... ...	125—130	...	...

a The quotation per £1 of Stock. *b* Acqual for Quarter. * Ex div.

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CONTENTS

EDITORIAL NOTES.

Gas Prices Report 257
The Force of Competition 257
National Defence 258
Recommendations 258
Coke Oven Gas in Scotland 259
Question of Stand-By Plant 259
Hydrogenation at Billingham 259

Personal—
Retirement of W. N. Westlake 260
The Institution Secretaryship 261
Correspondence—
Scottish Eastern Juniors' Visit to Bruce Peebles & Co. 261
1937 "JOURNAL" Directory. 261
Forthcoming Engagements 261
The Coal Position—Serious Shortage at Dundee 261

News in Brief 262
Amalgamation and Grouping—
Stellite, Ltd., and Llandudno 262
Canadian Gas Association—Change of Address 262
Relief of Rates and Gas Charges—Despite Burden, Rochdale Forges Ahead . . . 262
The Highlight of a Jersey Exhibition . . . 263
The Royal Fusiliers—Re-Union Celebration of the Coronation 263
South-Western Gas and Water Corporation, Ltd.—Dividend Announcement 263
Willing's Press Guide—1937 Edition . . . 263
Commercial Gas Company's New Showrooms for East London 264
The Joint Committee's Report on Gas Prices 265
The Society of British Gas Industries—Presidential Address of the Most Hon. the Marquess of Londonderry, K.G. 268
Trade Notes 270

Glover-West Verticals Installed at Salford . 271
Institution of Gas Engineers Examinations . 272
Cookery Courses for Brides-to-Be—Demonstrations by Edinburgh Gas Department . 279
Scottish Junior Gas Association (Western District)—
The Production and Performance of Domestic Coke. By Dr. W. Davidson . 280
Bombay Gas Company, Ltd.—Annual General Meeting 287
Athletic and Social—
Gas Undertakings' Small Bore Rifle League 289
Swansea Superannuation and Co-Partnership Schemes 289
Chester Co-Partnership Dinner 289
Gas Markets and Manufactures—
Stock Market Report 291
Current Sales of Gas Products 291
Contracts Advertised To-Day 291
Gas Undertakings' Results 291

Stock and Share Lists 293–94

For Advertisers' Index see PAGE 253

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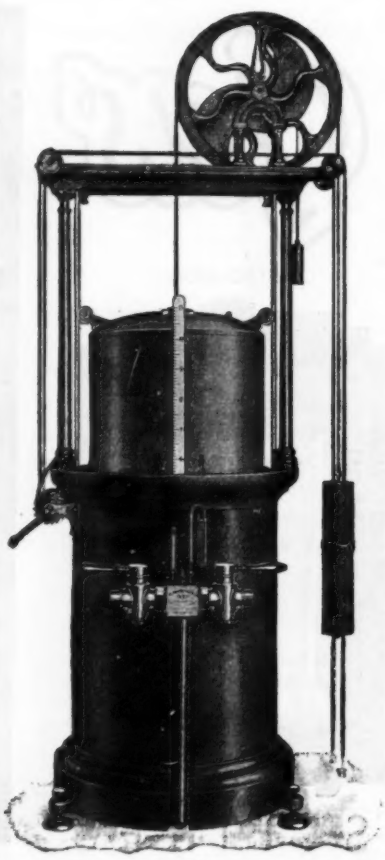

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